

IN 10 VOLUMES

ENCYCLOPAEDIA OF
WORLD
& PEOPLE



**ENCYCLOPAEDIA OF
WORLD AND PEOPLE**

ENCYCLOPAEDIA OF WORLD AND PEOPLE

(In 10 Volumes)

(Volume -7)

AUTHORITATIVE, COMPREHENSIVE
ILLUSTRATED

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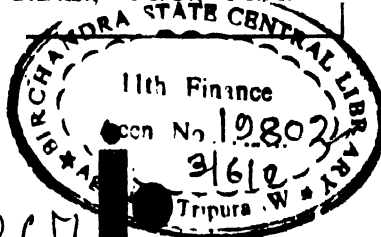
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REFERENCE

SL. No. - 367.

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THE WORLD BOOK

VOLUME

SEVEN

PHILIP OF SWABIA (about 1177-1208). Youngest son of Frederick Barbarossa, and one of the emperors of the Holy Roman Empire (which see). He became bishop of Würzburg in 1191, but in a year resigned from the Church and entered political life. Emperor Henry VI, his brother, gave him Tuscany to rule in 1195, and in 1196 he became lord over Swabia. When his brother died, he fought to secure Henry's former possessions for the family, but was assassinated after obtaining partial success.

PHILIPPA OF HAINAULT (1314-1369). Wife of King Edward III of England (who was her second cousin); she was daughter to William the Good, Count of Holland and Hainault. While Edward was in France with his army in 1346, Philippa was left to meet the danger from Scotland, and is said to have herself encouraged the English troops to victory at Neville's Cross. Shortly after, she went over to Calais and when the town had been starved into surrender, interceded with her husband for the six burgesses on whom the King's anger was about to fall. She was a patron of letters, and on Froissart's coming to England as a young man in 1361, Philippa received him and employed him as her secretary. Later she gave her patronage to Chaucer. She settled Flemish weavers at Norwich, and fostered what was to grow into an important industry.

PHILIPPI, *fil ip' i*. An ancient Greek city in Thrace, first known as Crenides, but renamed by Philip of Macedon (see PHILIP II) when he captured it some time before 350 B.C. The town was situated about nine miles from the Mediterranean coast, and near the coast town of Neapolis. It remained under control of Philip and of his successors until 168 B.C., when it fell to Roman conquerors. At Philippi, Brutus and Cassius fought against Mark Antony and Augustus, and the first-named two were defeated. When Augustus became emperor, he made Philippi a Roman colony. In the Christian Era, Paul the Apostle founded a church at this place. The ruins of the old town may yet be seen.

PHILIPPIANS, EPISTLE TO THE. A letter to the Christians at Philippi, written by Paul

while he was a prisoner in Rome. The date is supposed to be about A.D. 62.

PHILIPPICS. See DEMOSTHENES; PHILIP II OF MACEDON; CICERO.

PHILIPPINE ISLANDS. An archipelago of the East Indies, extending through about 25 degrees of latitude, and containing 7083 islands; area, 114,400 square miles. Luzon (40,814 sq. miles) and Mindanao (36,906 sq. miles) are the largest.

The People; Religion. The total population in 1934 was estimated at 13,055,220, of whom 90 per cent lived on the two largest islands. Most of the people are of Malay race, and those who came under Spanish influence in the past are commonly termed Filipinos. There were various waves of Malay invasion, the principal one being not long before the arrival of the Spaniards, while the latest arrivals, to the southern islands, came later and are known as Moros. In the remoter part of the archipelago there are various negro tribes who probably represent the aboriginal population. Many of the Filipinos are *mestizos*, that is, of mixed blood with Spanish ancestry. They control most of the trade of the islands. There are also some 50,000 Chinese, 8000 Japanese and a few thousand Americans and other whites. There is no general language, but about two-fifths of the population now understand English. Spanish is decreasing in use. There are about a score of native tongues and many dialects. Roman Catholicism is professed by about 10,000,000 adherents. The independent Filipino Church claims 4,000,000. Half a million Moros are Mohammedans, and a rather larger number of head-hunting hill tribesmen are pagans.

Education in public schools is free and secular, and aims chiefly at spreading a knowledge of English. There are many higher schools, trade schools, and agricultural schools; the University of the Philippines under the state; and the Santa Tomas University, founded in 1611.

Chief Towns. Manila, the capital city, is described in these volumes in a separate article. Other towns are—

Batangas, a seaport on the island of Luzon, 72 miles south of Manila. Population (1926) 41,182.

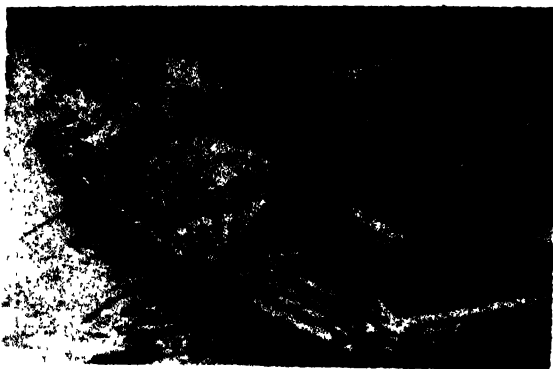
Cavite, the principal United States naval station in the islands, is on Luzon Island, 8 miles south-west of Manila. Population, 4500.

Sebu, on the east coast of the island of Sebu, is one of the chief commercial centres, exporting hemp, tobacco, sugar and copra. Sebu was the scene of Magellan's landing in 1521. Population, estimated, 79,000.

Iloilo, on the island of Panay, ranks second to Manila in commercial importance. Population, estimated, 43,913.

Zamboanga, on the island of Mindanao, is one of the chief commercial ports of the islands, exporting hemp, copra and gutta-percha. Population, including suburbs, estimated, 24,548.

Physical Features and Climate. The islands are mountainous, with ranges running principally north and south; between the main ranges and their rugged spurs are many isolated valleys. Volcanic rocks prevail and there are several active volcanoes; few of the peaks exceed 8000 ft. Coral reefs fringe many of the coasts. In the larger islands



PHILIPPINE NATIVE BOAT

This type is found throughout the East.

Photo: P. & A.

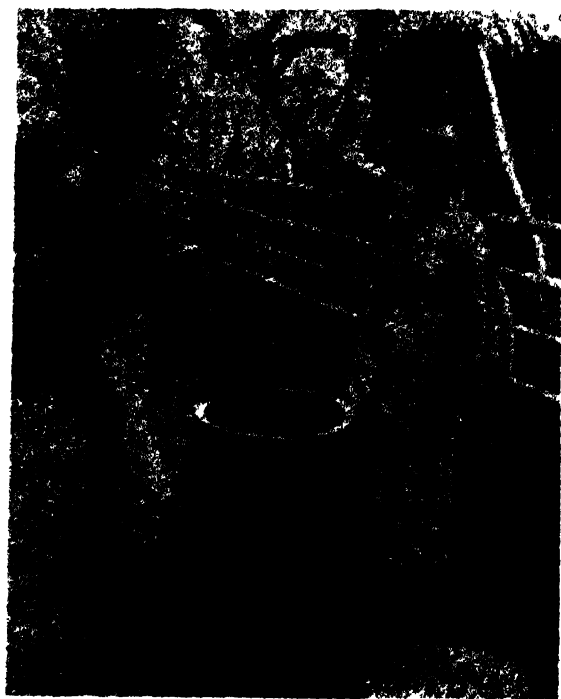
there are several rivers, but they are too swift to be navigable except by rafts. The climate is tropical, with rain from the south-west monsoon in summer and north-east in winter; sheltered areas are relatively dry, but no part suffers from lack of rainfall. Typhoons occur on the eastern side. Thick forests cover half the area and grassland the drier remainder. Only 23 per cent is cultivated, but 54 per cent is suitable for cultivation. Birds and reptiles abound, but the larger mammals are absent.

Resources. Rice, often grown by the help of irrigation and terracing, is the main diet of the Filipinos. Much rice has, however, to be imported, owing to primitive methods of agriculture. Maize, sugar, sweet potatoes, tobacco, many tropical fruits, abaca or Manila hemp and coconuts are also extensively cultivated; sugar, abaca and coconut products are the principal export crops. Rubber is of increasing importance since the Philippines afford the chief United States source of this commodity. Forest products include bamboo, rattans, hardwoods and dyewoods, but there is little exploitation.

Among livestock, pigs, goats and cattle are important and the water buffalo is used in the ricefields. Fishing on all coasts is actively pursued.

Gold is the principal mineral, with a little silver and platinum and some iron, but mining is not well developed. Manufactures include sugar-refining, tobacco factories and oil mills.

History. It was on his attempted



PRIMITIVE RICE MILL

In the Philippines both men and women share in such work as this.

Photo: P. & A.

voyage round the world in 1521 that Magellan discovered Mindanao and Sebu, and it was here that he fell in a little inter-tribal battle. Spaniards made a permanent settlement at Sebu in 1565, and founded Manila in 1571.

Undisturbed in the next three centuries, except by the British occupation of Manila from 1762 to 1764, the Spanish established their government over most of the people, though they never penetrated the interior of the larger islands, nor subdued the Moros.

In December, 1899, the United States annexed the Philippine Islands upon payment to Spain of £20,000,000. Further progress in economic development was then made. There are now 837 miles of railways and 4785 miles of first-class roads. Manila is the terminus of the U.S. Pacific air line.

Government. A widespread desire for independence in the islands led in 1933 to the passing by the United States Congress of a bill providing for a referendum of the inhabitants on this question, and in 1934 a second bill granting "Dominion status" was promulgated. In 1935 a President (Don Manuel Quezon) was elected for the islands for a five-year term. The older framework of government was retained. Complete independence is planned for 1944.

PHILIPPPOPOLIS, *fil ip op' o lis*. See BULGARIA.

PHILIPS, AMBROSE (1675?-1749). Poet. In his own day Philips had a considerable reputation as the author of some poetic *Pastorals*, which, to the mortification of Pope, were frequently esteemed above his own. Pope had his revenge, however, when, as a result of some rather childish verses, Philips was given the nickname of "Nabby Pamby." The two words passed into common usage, and have served to keep the name of Philips alive.

PHILIP THE EVANGELIST, sometimes known as PHILIP THE DEACON. He was one of the "seven" nominated by the Church to attend to the daily distribution of food and alms to the needy, following the complaints of the Greek Jews that their widows were being neglected. When persecution scattered the Church at Jerusalem, Philip went to Samaria to begin his work as an evangelist. He continued his mission southward, and on the desert road to Gaza converted the Ethiopian eunuch. Later he preached in Azotus, known also as Ashdod, whence he returned by stages to Caesarea, where 20 years later he gave hospitality to Paul and his companions. According to tradition, he became Bishop of Tralles in Caria.

PHILISTINES, *fil' is tins* or *fil' is tins*. Persistent foes of the Israelites in the period from the conquest of Canaan to the reign of

David, a mixed people occupying the southwest coast of Palestine. They had five fortified cities, Ekron, Ashdod, Gath, Ashkelon and Gaza. Delilah, the betrayer of Samson, and Goliath, the giant whom David slew, are well-known Bible characters who belonged to this people. Saul and Jonathan were slain by them in the battle of Mount Gilboa. The power of the Philistines was permanently broken by David.



SAMSON TAKEN CAPTIVE BY THE PHILISTINES
(From the painting by Rembrandt)
Photo: Mansell

Uncultured or worldly-minded persons are often called "Philistines." The term was popularized in England through Matthew Arnold's use of it in *Culture and Anarchy*.

PHILLPOTTS, EDEN (born 1862). An English novelist whose works reveal interest and sympathy. His strength lies in the primitive simplicity of his characters. In much the same way as Thomas Hardy is the exponent of the life of Wessex, Phillpotts is identified with the country life of Devonshire. He first achieved the recognition of English readers with a novel, *Lying Prophets*, published in 1897. Subsequently, he wrote a great number of novels, books of plays, and poems. Foremost among his other novels are *Children of the Mist*, *Sons of the Morning*, *The River*, and *The Secret Woman*. His comedy, *The Farmer's Wife*, produced in London in 1924-6, had great success.

PHILOLOGY. Philology is the name given to the comparative and historical study of language (see LANGUAGE). It may take two forms: (1) the determination of relationships between languages which appear at first sight to be unrelated; thus it may establish the kinship of German, English, Danish, and Gothic through a common (lost) ancestor, Primitive Germanic; and the relationship of this group to the Celtic languages (Welsh, Irish, Gaelic), the classical languages (Latin, Greek) and the Indian group of languages

through a lost ancestor called Indo-European; (2) the history of a particular language after it has become isolated from the parent group (as the history of English from Old English to the present day).

As a scientific study, Philology dates back to the early nineteenth century, which saw the inception of modern scholarship with its fundamental re-discovery of "the idea of development or evolution pervading the whole universe." Before then the notion of different languages being related to each other through a common ancestor did not accord with the scriptural picture of the origin of all languages in the confusion of Babel, though Dante had observed the kinship of French and Italian.

Phonology. The first serious work was done by Sir William Jones and other Englishmen who studied Sanskrit, and by the Danish scholar Rask and a German, Grimm, who quite independently formulated the principal rules of correspondence between the Germanic languages and other European and Indian languages and so established the existence of a lost parent language and the principle of linguistic evolution. This rule, often called "Grimm's Law," recognized such correspondences as the following: Sanskrit *f*, Latin *f*, Greek *p* corresponds to Germanic *f*; e.g. Skt. *padam* (acc.), Grk. *πάδι* (gen.), Latin *pedem* (acc.) but English *foot*, Swedish *fol*; Skt. *panca*, Welsh *pimp* but English *five*; Latin *pecus* "cattle" but English *fee*; Latin *piscis* but English *fish*; Skt. *upāri*, English *over*.

Skt., Lat., Grk., Celtic *t* corresponds to Germanic *th*: Skt. *tanus*, Lat. *tenuis*, English *thin*; Grk. *τρίς*, Lat. *tres*, English *three*; Lat. *tu*, English *thou*; Lat. *frāter*, English *brother*; Lat. *dentis* (gen.), Irish *deit*, English *tooth*.

Skt. *s* or *h*, Lat. *c*, Grk. *κ*, Celtic *c* correspond to Germanic *h*: Skt. *śatām*, Lat. *centum*, Welsh *canl*, English *hundred*; Skt. *sūnas* (gen.), Lat. *canis*, English *hound*; Skt. *kalāmas* "writing reed," Grk. *καλαμος* "reed," English dialect *haulm* "straw."

Many of these correspondences have, of course, been obscured by later developments in every language, particularly in the case of German.

Evolution in Language. The frequency and regularity of these correspondences in Indo-European tongues proved that the connection between such languages was not chance; they pointed to a common ancestor. This ancestor is lost, but it must have been very much like Sanskrit in its elaborate grammatical structure.

At the same time it supposes that for languages to differentiate thus they are subject to some evolutionary process, and

this phenomenon of change is one of the most clearly observed facts in philology. It can be exemplified in many ways. For instance, it is well known that in the poetic works of Elizabethan writers there are many rhymes (e.g. *love-move*, *room-come*, *east-best*, *feasted-requested*, *speak-break*, *warm-harm*, *war-star*) which are not true rhymes to us; we cannot assume that in these particular vowels the Elizabethans were unskilful craftsmen, but that the rhymes were accurate when they were made and the pronunciation of those vowels has changed. Such changes can, indeed, be observed in living languages: thus, in modern English, when certain consonants at the end and beginning of words come together in a sentence, they undergo a change: *s* and *y* tend to become *sh* (e.g. *pass you* becomes *pāshu*), *t* and *y* become *ch* (e.g. *bet you* becomes *bechu*), *d* and *y* become *j* (e.g. *bid you* becomes *bijū*): changes which have long taken place in our pronunciation of words like *passion* (formerly *pasyon*), *felch* (formerly *fetyen*). We can observe also various vowel changes taking place in "fashionable" pronunciation.

Changes in Pronunciation of a language are the most regular of all linguistic changes. Practically all Old English words which contained the vowel *ā* and which have survived will be found in Modern English with a diphthong *ou*, whatever the spelling, as Old English *bān* (bone), *cāmb* (comb), *rāp* (rope), *hlāf* (loaf), *stān* (stone). Similarly all Old French words which contained *-al-* followed by a consonant in modern French have *-au-*, as Latin *salvum*-French *sauf*, *falconem*-*faucon*, *falsum*-*faux*. Such changes are generally stated as "sound laws," but this term is misleading. "Laws" are immutable and admit of no exception; and neither of these characteristics is possessed by linguistic change; in any case, in philology the so-called "law" can only be formulated *after* the event. It is impossible to forecast in what direction a language will change.

There are other less gradual changes which upset this normal evolutionary tendency in language; these may be called "linguistic accidents." Chief among them is *analogy*. This type of change affects unusual and apparently irregular forms, which are replaced by new forms modelled on regular and common patterns. A child, for instance, who says "gooder" instead of "better" is making a new form on the analogy of the common English way of making a comparative of an adjective (*bright-brighter*, *dark-darker*). There are many such changes in English, especially in grammatical forms. In Old English there was a large class of weak nouns forming their plural in *-en*, as *spāca*

"spoke," *spācan* "spokes," *blostma* "blossom," *blostman* "blossoms"; but there was a larger class of strong nouns forming their plural in *-as* (modern English *-es*, *-s*), as *stān* "stone," *stānas* "stones," *weg* "way," *wegas* "ways"; the former class of nouns, by analogy with the latter more common class, now forms its plurals in *-es* or *-s*, as in *spokes*, *blossoms*, *ears* (Old English *earan*). Again, there are two ways of forming past tenses in verbs in English. One method is to change the vowel of the present tense, as *ride-rode*, *drive-drove*, *bind-bound*, but although this class of verbs is still common, it is not a "living" method. The other way is to add a suffix *-ed* to the present stem, as *love-loved*, *rear-reared*; and from Old English times all new verbs (especially those borrowed from other languages) have formed their past tenses in this way. Occasionally, however, analogy has caused such a verb to be adopted as a strong verb, as the verb "strive" (from French) which should have had a past tense "strived," but because of its similarity to strong verbs like *drive*, it was treated as a strong verb with a past tense *strove*.

Vocabulary. Besides recording such changes in pronunciation, Philology also deals with the history of words, and it is in its vocabulary perhaps more than in any other feature that a language reflects the history and mentality of a people, for words are lost, others are adopted or made, and meanings and usages changed, all aiming at variety of expression and the subtle differences which a highly developed people requires. The growth of English in this respect has been enormous, as a comparison between Bosworth-Toiler's *Anglo-Saxon Dictionary* in one volume with a supplement and the *New English Dictionary* in ten volumes will show. Many words have, of course, been lost in the passage of time, and this may be amply illustrated from the vocabulary of any of Shakespeare's plays. Such words as *bisson* "blind," *cautel* "deceit," *clepe* "to call," *rede* "counsel," *shent* "insult," *yaw* "stagger" (all from Hamlet) have been lost. Frequently, the loss of words is not total, for some dialects of a language may preserve archaic words in common use, as *thole* "to suffer," *quick* in the sense "live" (cf. "the quick and the dead"), or such Shakespearean words as *bound* or *boun* (King John), "ready, destined"; *hecksies* (Henry V), "hemlocks"; or *cracker* (King John), "idle talker." The names of objects no longer in use also fall into disuse, except amongst interested antiquarians.

On the other hand, new inventions demand new names, and frequently such names are entirely new creations, as *telephone*, *tele-*

vide, *radio*, besides protected trade-names like *tabloid* which has become an element in the common wordstock. More often, however, existing vocabulary is adapted to meet new demands upon language, and many examples of this will be found in motor-car nomenclature: *piston*, a variant of *pestle*, meant "a rammer or pounder"; *clutch* meant "a claw," then something which seizes; *cam* is connected with the word *comb* and meant "a toothed instrument" and then a wheel or axle with a tooth or cog on it for raising a lever; the word *crank* is connected with *cringe* "to bend" and was used originally of the part of a shaft bent to form a handle; *sprocket* was formerly the name of a triangular piece of wood used in building the eaves of a house, and later of triangular projections on the periphery of a wheel and later still of the cog-wheel itself. Slang, which is colloquial (and sometimes vulgar) idiom, also brings additions to a language, but generally they are short-lived. Exceptions are, however, found in proper names like *Volt* and *Ohm*, which remain in active scientific use in honour of the men themselves. But these words have not been adopted through the slang usage which led to the coinage of *grog*, *dunce*, etc.; *grog* was first a nickname for Admiral Vernon, who wore a coat of grogram, and then for the rum and water which in 1740 he ordered to be served out to his sailors. The word *dunce* was the name given by opponents to a follower of the schoolman John Duns Scotus (c. 1300) who was a "cavilling sophist," and then, with the progress of philosophical studies, the name was used of "one incapable of assimilating the new learning," and finally of "a dull, obstinate person." Mackintosh, Raglan, Macadam, Chesterfield, Davenport are other examples of the passing of proper names into common nouns.

Change in Meaning. This field of philology is called *semantics*, and its object is to show that as vocabulary increases in range, a language tends to seize the advantage by making its words express finer shades of meaning than is possible with a limited vocabulary. It might be assumed that there is no difference in meaning between *careful* and *meticulous*, that they are synonyms; but this is not so, for the latter rather implies a feeling of fastidious pedantry. Change of meaning is a very well evidenced linguistic process in English, as two examples will show: the word *deer* in Old English meant "any wild animal, especially one which was hunted"; in Middle English it also acquired a specialized meaning for the noblest of animals of the chase, the red deer, and *deer* in the wider sense was supplanted by *beast* (from French). The word

career was from Latin *carraria* via "carriage way." Old French *carriere* "road"; in English it first had the sense "a track for galloping horses" (cf. the verb "to career"), and then figuratively of a path (profession) to be followed in life. In other languages, too, there have been semantic processes at work; in French, for instance, *dépôt* was originally the thing deposited, now the place where it is deposited; *bureau*, from *bure* "rough serge," was first "the cloth used to cover a table," then "the table or desk," then "the room accommodating the table," and later as now "an office with all its equipment and personnel."

The greatest changes in vocabulary, however, are brought about by race-mixture. When two races come into contact in a single geographical area there is bound to be mutual influence upon their languages, but the conditions of fusion and assimilation are not always alike, and the results of race-mixture on language are varied. If a conquering nation is small numerically it does not impose its language on the defeated foes; thus the Scandinavians who settled in Northern France adopted French, and later, when they came to England as Normans, they had ultimately to learn English. It was only so long as political contact with France lasted that the French language persisted in use in England. On the other hand, if a conquest is effected by large bodies of invaders who settle with their families and dependents and the settlement proceeds for a long period, the conquerors form not only the ruling classes but to some extent the lower classes of the new community; natives become slaves, and their language is soon laid aside, except for a few humble terms and place-names. Thus the Angles and Saxons imposed their language upon Britain, and in more recent times, their descendants have carried it to all parts of what is now the Empire.

In either case the fusion and replacement of one language by another is to be explained according to Windisch's theory. When we learn a foreign language we do not mix that language with words from our own vernacular, but when we speak our native language we may and often do tend to use words from the foreign language we are learning. Jespersen points out a striking instance of this: Frederick the Great prided himself on his knowledge of French, and in his native German writings one finds many French words, but in his French writings not a single German word. The theory turns on this formula: that it is not a foreign language which a nation learns that becomes mixed, but its own native tongue. According to this, the Angles and Saxons can never have

attempted to learn British, for there are only very slight traces of Celtic admixtures in the English language. See ENGLISH LANGUAGE.

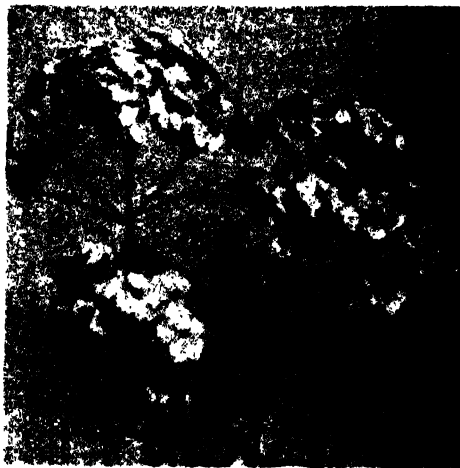
PHILOSOPHER'S STONE. See ALCHEMY.

PHILOSOPHY. See ETHICS; LOGIC; METAPHYSICS.

PHLEBITIS, *fle bi' tis*. Inflammation of the veins, occurring, as a rule, in the legs and thighs, usually in persons who are debilitated by some chronic disease, or confined for a long period to bed for any reason. The blood in the vein forms a clot, and there is acute pain for a few days; the vein, if near the surface, is felt as a firm cord and the whole limb becomes swollen. Absolute rest is called for, at least for three weeks: this is to minimize the risk of a portion of the blood clot becoming detached and carried in the blood stream to the heart or lungs, a misfortune which nearly always results in sudden death.

PHLEGETHON, *flag' e thon*. In mythology, the river leading to eternal torment. See FURIES; TARTARUS.

PHLOX. A flowering plant of which many species have scarlet blossoms—whence their name (Greek for "flame"). Phlox are



PERENNIAL PHLOX

Photo: Keystone

native to North America and Northern Asia. Because of their hardiness and ease of growth in fertile soil, perennial phlox are of great value in the herbaceous border, and many splendid varieties have been developed by breeding. All annual kinds are derived from *Phlox Drummondii*, a species that grew wild in America. The border kinds have a wide range of colour—creamy white, pale yellow, deep pink, salmon-pink, magenta, purple, lilac, and crimson. Annual

varieties of phlox are grown from seeds; the perennials from seeds and from stem and root cuttings.

Scientific Names. The phlox genus belongs to the family *Polemoniaceae*. The border (perennial) phlox is *P.*

PHOBIA, fō' bia. See ANXIETY; NEUROSIS.

PHOCION, fō' shion (c. 402-317 B.C.). An Athenian general and statesman. In his youth he was a pupil of Plato. He first came into prominence in 376 B.C., when he held a subordinate command at the important battle of Naxos, and by the middle of the fourth century B.C., he had become one of the foremost men in Athens. He opposed Demosthenes in his uncompromising attitude toward Philip of Macedon, for he felt that resistance would be in vain. He was several times successful in battle against Philip and proved himself an able negotiator in peace discussions (see PHILIP II); though he was never able to convince the people of the wisdom of his point of view, he was always able to make better terms with the Macedonians, when they were victorious, than anyone else could have done.

In his old age, Phocion became involved in political intrigues which compelled him to take refuge with the Macedonians. They, however, delivered him up to the Athenians, who forced him to drink poison.

PHOCIS, fō' sis. An ancient district in Central Greece, containing Mount Parnassus and the Delphic shrine. The people of Delphi itself were of the ancient Doric stock, and the efforts of the Phocians to expel them led to several "sacred wars" in which the Delphians were defended by the rest of Greece.

PHOENICIA, fe nish' ia. The first great commercial power was a nation which dwelt in part of the land known to the Old Testament as Canaan. It was on the extreme Eastern Mediterranean shore, extending from Myriandrus in the north to Mount Carmel in the south, a distance of nearly 200 miles. It is not known when it had its beginning, but by 1500 B.C. its cities were large and prosperous.

The inhabitants of Phoenicia were of Semitic origin. They created a great navy to protect their commerce. Their vessels sought out every available trading post in the Mediterranean, and even passed the Strait of Gibraltar, sailing north and returning laden with tin from the mines of Cornwall. By caravan routes came perfumes and spices from the Far East, and gold, pearls and frankincense from Arabia; and in addition to these articles, the Phoenicians traded in silver from Spain; slaves, ivory, and skins from Africa; linen from Egypt; copper from Cyprus; Tyrian purple dye and

wrought silver and brazen vessels from Sidon. They are believed to have reached the Baltic in quest of amber.

Wherever they went, they established colonies for trading purposes, forming centres of commerce in Cyprus, the southern coast of Asia Minor, Southern Spain, Sicily, Sardinia, and the northern coast of Africa. Chief among these trading centres was Carthage, destined later to dispute with Rome the mastery of the world.

They learnt much from other countries and were renowned for their culture and industrial art. The present English alphabet is based on that of the Phoenicians.

Politically, Phoenicia had little ambition, and in time submitted to more powerful neighbours. Its cities and its navy, however, made it indispensable in the scheme of world politics, and though, after 850 B.C., Phoenicia became tributary in turn to Assyria, Babylonia, Persia, Egypt, Greece and Rome, its position was more that of a helpful ally than of a subject state. Until its conquest by Alexander the Great, in 332 B.C., it maintained its commercial supremacy. Under the Roman rule after 64 B.C., as a part of Syria, the country lost its identity.

Religion. Like the Assyrians, the Phoenicians adhered to a religion which was cruel and harsh. It was animistic, and fertile fields, trees, mountains, rivers, etc., were thought to be of sacred import. The Phoenicians borrowed ideas and practices from the worship of many nations.

Baal, the sun god, was given human offerings, and to him, in times of national calamity, it was customary to sacrifice every first-born child. There was, however, no one particular Baal, each city having its chief deity called by the name Baal, who was responsible for the fertility of the soil and for the general prosperity of the city. Astarte, the moon goddess, was also the goddess of love; she was the Phoenician form of Aphrodite or Venus, and her worship was conducted with lascivious rites.

Cities. Tyre and Sidon, each a large city with a harbour, formed the centres of Phoenician commerce, manufacture and art. Though the cities were built originally on islands, the ancient sites are now connected with the mainland, and their harbours are no longer deep enough for ships of commerce.

Sidon. At various times this city held the supreme place in the Phoenician confederacy, alternating with Tyre in this rôle. The people of Sidon were skilled traders and artisans. There is a tradition that they manufactured glass from the fine sand of the Belus River, and Pliny credited them with the discovery of the process. A number of magnificent sarcophagi have been found in

this vicinity. Fruit gardens now cover the ancient site of Sidon. The modern town of Saïda, a place of about 12,000 people, occupies a portion of the site.

Tyre was situated 24 miles south-west of Sidon. The original city was built on a small island three-fourths of a mile from the mainland. When, in 332 B.C., Alexander the Great carried on a famous siege of the city, he constructed a causeway joining the island to the mainland, and this, widened by deposits of sand, has transformed the island into a peninsula. There is a small, unimportant town of Sur, built about a harbour at the north end of the peninsula. In the Roman period, Tyre occupied both the island and a strip along the mainland.

Centuries before the birth of Christ, Tyre was one of the greatest of maritime cities. It reached the zenith of its power under the rule of King Hiram (c. 990 B.C.), who was the contemporary of Solomon and supplied the cedar wood and workmen for the building of the Temple at Jerusalem. About 850 B.C., Tyrian colonists founded Gades (Cadiz) in Spain, and Carthage in Northern Africa. The mother city in this period was widely known for its purple dyes and glassware. During the Roman period, it was a centre of learning, and in later years, it revived as an industrial centre. The Crusaders captured it in 1124. Tyre remained under Christian domination until 1291, but in that year it was captured and destroyed by the Moslems.

PHOENIX, *fe' nix*. A fabulous bird held sacred by the Egyptians. It was supposed to have red and golden plumage and to resemble the eagle in size and form.

It was thought that on reaching an age of about 500 years the phoenix burned itself to death on a pyre of its own making. Pliny mentions the contemporary belief that there was but one phoenix on earth at a time, and when it died upon the pyre it had erected, the young phoenix which developed from the ashes became, in its turn, the only representative of the species. Another legend tells of the sweet song of the phoenix, at morning.

PHONETICS, *fo net' iks*. The science of the sounds of speech, and their representation by alphabetical characters. It concerns itself at the outset with the vocal organs and their relations to each other, whereby articulate speech is produced; with the resonance cavities of larynx, pharynx, nasal passages, and mouth, and with the effect produced by them on the air expelled from the lungs. Many sounds which to the casual observer seem identical are shown by such close study to differ in their method of production and hence in their actual phonetic value.

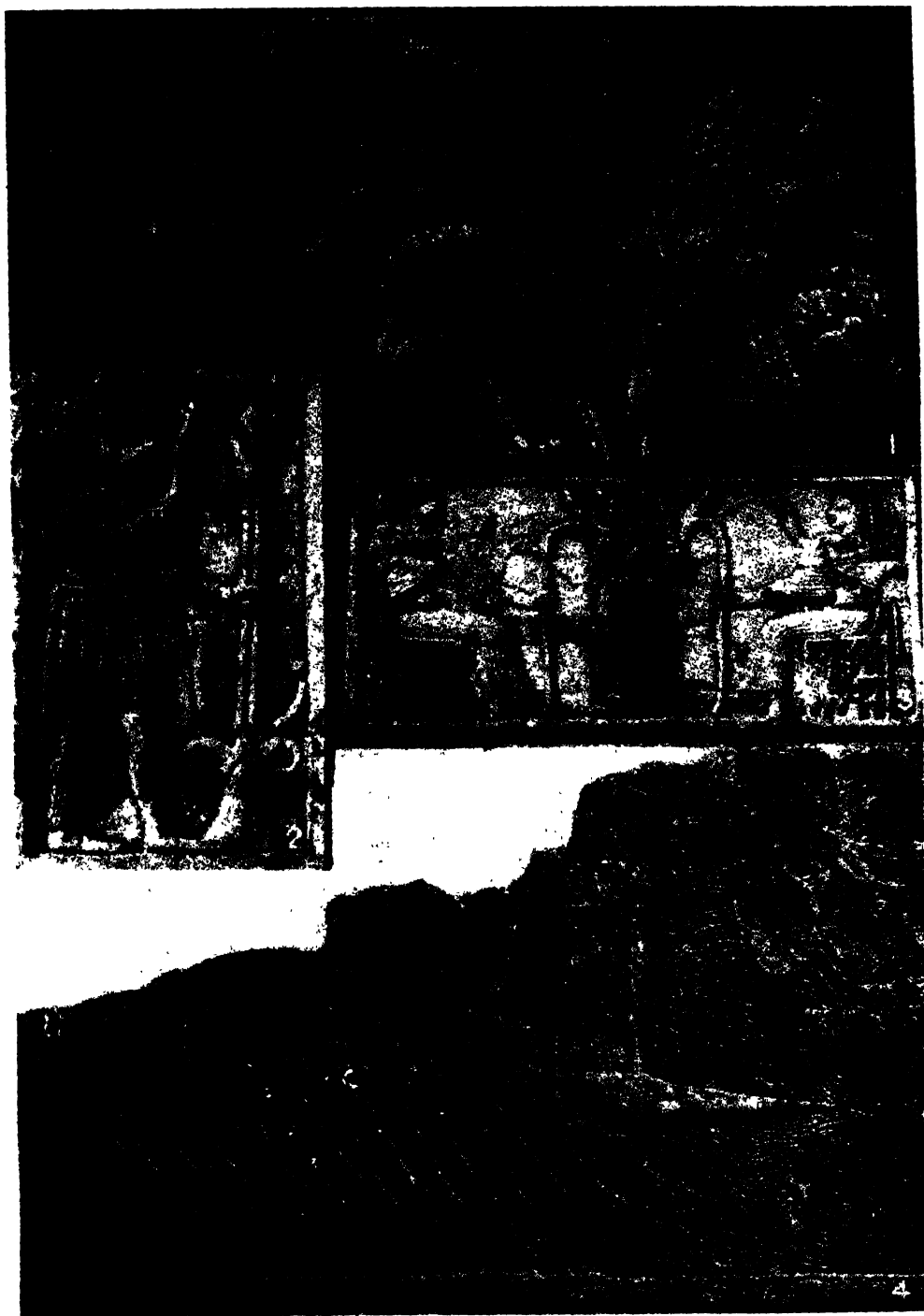
The phonetic ideal is an alphabet which

has a symbol for every sound used in the language, and no unnecessary symbols. Perhaps there has never been an alphabet which fulfilled these conditions. The difference between sound and symbol results from the change in the pronunciation of words for which the original phonetic spellings have been retained. In the time of Chaucer, *knight* was pronounced just as it is spelt, the *gh* having the sound of *ch*. Some languages are far more nearly phonetic than others; thus the Spanish has very few exceptions to its sound system, and the German is a close second. In German, almost every letter of the alphabet has one sound only, and there are few silent letters in words, practically all exceptions being covered by a few definite rules.

Phonetic Weakness of English. With English, however, the case is quite different. With the possible exception of French, no other language equals it in irregularities and arbitrary distinctions. English speech calls for certain sounds which the Latin people did not use, and for these the Latin alphabet, adopted almost without a change, afforded no symbols. In many instances, too, pronunciations have changed, and words which were formerly phonetic are now not so. How far the English alphabet fails of being a perfect phonetic medium may be seen by an examination of letters *A, E, I, O, U, C, G, J* and *S*, and their sounds. Each of the vowels is forced to do duty for several sounds, the first for no fewer than eight; and occasionally these sounds overlap, or duplicate the pronunciation of certain diphthongs; *C* is an unnecessary letter, except in such combinations as *ch*, for one of its values is equally well represented by *k*, the other by *s*. These facts, taken in conjunction with the very frequent silent letters, show why English is so difficult a language for a foreigner to master.

A number of attempts have been made to reduce English to a phonetic basis. Phonetic alphabets, wherein each sign represents, wherever it is found, one definite sound value, have been suggested by various scholars, the English alphabet being taken as a base, and additions and subtractions made where absolutely necessary. Attempts at spelling reform in the direction of phonetic spelling have made some headway. The chief argument against all attempts at reform is that if phonetic divergences were less common, they might be corrected and yet leave the language practically as it stands; but, in fact, a wholesale sweeping away of all the irregularities would render all previously written books unintelligible.

PHOSGENE, *fos' jeen*. A colourless suffocating gas that is fatal when breathed in



1, 2, and 3. Ivory reliefs from Nimrud ninth to eighth centuries B.C. 1. Shows the use made of the Sphinx in formal decorative work. 2. A decorative panel with priestly or divine figure who is reverencing the lotus flower, possibly symbolic of the life force. 3. The two figures hold *tkam* sceptres, emblematic of divinity, and adore the *cartouche* in the centre. 4. Assyrian Biram (705-681 B.C.). The Phoenician ships were of the same type. Notice the "ram" and protective shields.

Photos: British Museum

any but minute quantities. It decomposes by the action of water into hydrochloric and carbonic acid. It will discolour in acetic acid and benzine, and boils at about 47°F . This gas was one of the principal lung irritants used by the belligerents in the World War (see POISON GAS). It is a deadly gas, but comparatively volatile, and may be carried away in a few minutes by a light breeze, or be dispersed by hot sunshine. Its effect is not passing, but often leads to acute pulmonary oedema. In industry it is employed in the manufacture of dyestuffs, and in the chemical laboratory it is a valuable agent. Phosgene is prepared by passing equal volumes of carbon dioxide and chlorine over animal charcoal. It was first made in 1811.

Chemical Formula. The formula for phosgene is COCl_2 ; that is, a molecule consists of one atom of carbon, one atom of oxygen, and two atoms of chlorine.

PHOSPHATES, *fos' sayts*. Compounds containing phosphoric acid (which see). They are abundant in nature, occurring in phosphate rocks in combination with lime and magnesia; and in the remains of animals (bone ash) and of plants (vegetable mould). Phosphates are necessary to the growth of plants and animals. When crops are produced year after year on the same soil, the natural supply of phosphates is gradually removed, and artificial fertilizing by means of manure becomes necessary. Phosphate rock is the chief source of fertilizer containing phosphates. By crushing the rock and treating it with sulphuric acid, a soluble fertilizer known as superphosphate is made, which acts much more quickly than the pulverized rock. Large amounts are consumed in the manufacture of baking-powder.

Research is being carried on to produce phosphoric acid directly from phosphate rock.

PHOSPHOR BRONZE. See BRONZE.

PHOSPHORESCENCE, *fos for es' ens*. The emission of a pale, sometimes ill-defined light, by bodies possessing the quality of becoming self-luminous after exposure to light. It does not owe its origin to combustion. The substance in which this peculiarity was first noticed was barium sulphide, discovered by a Bologna shoemaker in 1602. It was quickly found that there were many other bodies with like qualities. The ancients knew that a diamond when slightly heated became phosphorescent, and Pliny mentions other gems which gave off a light of their own when in darkness.

Phosphorescence must not be confused with the luminosity of phosphorus. The light coming from phosphorus is caused by oxidation, and does not depend on previous

exposure to light, while phosphorescence is the direct result of such exposure. The application of heat will cause some substances to become luminous in a darkened room; in some cases, notably with a variety of fluor-spar, the heat of the hand is sufficient. In some cases the phosphorescence lasts only the fraction of a second, in others it lasts for days. Phosphorescence of extremely short duration is usually called *fluorescence* (which see). It has also been shown that the vividness and duration of phosphorescence of many substances, especially calcium sulphide, depend on the presence in that substance of impurities, such as manganese, bismuth and copper. Gelatin, celluloid, paraffin, and ivory are phosphorescent at very low temperatures, while certain other substances are phosphorescent only when subjected to friction.

The most interesting cases of phosphorescence occur in the animal world. Free phosphorus is so poisonous to living things that it is apparent that it can play no part in animal luminosity. In some of the lowest forms of life, the whole body is phosphorescent, as in the case of the jelly-fish. In other organisms, such as the firefly and glowworm, the luminosity is localized. Probably, in some insect life, phosphorescence indicates the presence of disease. The great displays of phosphorescence in sea-water are due to the presence of innumerable phosphorescent organisms.

Derivation. The word *phosphorescence* comes from the Greek *phos*, light, and *phoros*, bearing.

PHOSPHORIC, *fos for' rik*, **ACID**. There are three acids of phosphorus (which see), but when the term "phosphoric acid" is used without qualification *orthophosphoric acid* is referred to. It is usually produced commercially by treating bone ash or some other phosphate with dilute sulphuric acid and subjecting the solution to filtering and concentration. It has a medicinal value.

Chemical Formula. The formula for orthophosphoric acid is H_3PO_4 ; that is, a molecule is made up of three atoms of hydrogen and the radical PO_4 . This is an association of one atom of phosphorus and four atoms of oxygen, which act as a single atom in chemical reactions.

PHOSPHORUS, *fos for us*. Common phosphorus is a yellowish, wax-like, non-metallic element. When exposed to the air in a dark room, it glows or is *phosphorescent*. It burns at ordinary temperatures, and melts at about 44°C . Yellow phosphorus is very poisonous, and is unsafe to handle unless under water. Burns from it are difficult to heal, and a small dose of it will cause death. Because of its liability to take fire, it has to be kept under water.

Until recently, the chief use of phosphorus

was in the manufacture of matches (which see), but the disease known as *phossy jaw*, which is a rotting of the jaw-bones, has led to the prohibition of the use of yellow phosphorus in most countries where matches are produced.

When burned in a good supply of air, phosphorus forms the dense, white vapour called phosphoric oxide, which immediately absorbs water from the air and dissolves, forming phosphoric acid. The most extensive phosphorus works are at Oldbury, Staffs.; Lyons, France; and at Niagara Falls, U.S.A. Bone ashes and phosphate rock form the raw material.

Phosphorus is necessary to the growth of plants and animals. The plants take phosphorus from the soil (see FERTILIZER), and animals obtain it from the plants.

Red phosphorus, an allotropic form (see ALLOTROPY), is made by heating ordinary phosphorus to a high temperature in a closed vessel. It is a brownish-red powder and does not burn nor does it melt except at high temperatures. Phosphorus is not found free in nature, but exists in plants and animals and in phosphate rocks. Its chemical symbol is *P*. See PHOSPHATES.

PHOSPHORUS, in astronomy. See EVENING STAR.

PHOSSY JAW. See MATCHES; PHOSPHORUS.

PHOTIUS, *phō'shius* (c. 820–c. 891). A Byzantine prelate and statesman. He was born in Constantinople and, when the illegal deposition of Ignatius occurred, was elevated from the standing of a layman to the patriarchal dignity of Secretary of State to Michael III. Pope Nicholas I deposed him in 863 as a usurper, but Photius retaliated and in turn excommunicated Nicholas in 867. In the same year, Photius was exiled, but later was restored to patriarchal dignity.

In 879 he assembled a council to discuss the differences at issue between the East and Rome, and the decisions were made according to the dictates of Photius. As a result, he was excommunicated by the Pope in 881. Five years later he was exiled by Leo the Philosopher; he died in an Armenian monastery.

PHOTO-CHEMISTRY. A branch of physical chemistry dealing with the action of light causing chemical changes in substances, and also with the action of other electromagnetic radiations at either end of the visible spectrum. The earlier phase of photo-chemistry concerned the effects of visible light upon certain silver compounds, such as the chloride, iodide, and bromide, this action being the basis of the art of photography. The scope of the science, however, widened with the discovery and investigation of the invisible radiations of

varying wave-lengths, such as infra-red and ultra-violet rays, Röntgen or X-rays, and radium emanations. The infra-red rays, which have great penetrating power, were found to affect certain chemical substances, with the result that they are now used in photography for penetrating haze and mists in photographing distant objects. At the other end of the spectrum, the ultra-violet rays not only affect a sensitized plate, but also various other substances, and this fact is utilized at the present time in the preparation of Vitamin D, "the sunshine vitamin," by irradiation of ergosterol, a substance occurring in the skin and fats. Ultra-violet rays also cause fluorescence in many substances: advantage is taken of this action in discriminating between various vegetable and mineral oils, and between varieties of pearls, silk, cotton and other textile fibres. The bleaching effect of these rays on fabrics is well known. The study of X-rays and of other radiations in their effects upon animal tissues has provided medical science with a new means of diagnosis and treatment.

PHOTO-ELECTRIC CELL. See CINEMA; TELEVISION.

PHOTO-ENGRAVING. The process of preparing engraved plates or blocks for printing, by means of photography and etching. The plates are prepared on two general plans, one in which the background is etched away, leaving the design or picture to be printed in relief, and the other in which the design is etched into the plate, leaving the background in relief. The first is known as *relief* photo-engraving, and the second as the *intaglio* process, or photogravure. All the methods have as their basis the fact that light will create an insoluble photographic image on a plate treated with gelatin, some forms of albumen, or bitumen.

The half-tone is the most common form of relief photo-engraving.

Gelatine Relief. In making a plate in relief for the reproduction of linework, a glass plate coated with a film of gelatine and potassium bichromate is exposed under a black-and-white negative. The film is then soaked in water, and the lines that were protected by the dark parts of the negative swell, while the other parts of the film do not swell. The film is then laid in a mould, and a wax or plaster impression of it is taken. From this impression an electrotpe (see ELECTROTYPING) is made.

Photogravure. In the photogravure process, a copper plate, covered with a sensitized film, is exposed to a black and white positive, or photograph, on glass. The parts under the clear spaces are hardened, and those under the shaded parts, corresponding to the shades in the picture, remain soluble in varying

degrees. The plate is then washed, and the soluble portions of the film are removed, leaving the metal bare. The plate is then etched and hardened. The grain often seen in photogravure pictures is produced by sprinkling the plate with powdered resin, which is heated in. See ENGRAVING; ETCHING; HALF-TONE; INTAGLIO.

PHOTOGRAPHY. An art which now influences every science, profession, industry, and trade. It is also one of the world's greatest and most popular hobbies. It enters more or less into every walk of life; for example, the doctor and the surgeon in the X- (Roentgen) ray, the architect, engineer, lawyer, surveyor, soldier, sailor, flier, map-maker, archaeologist, astronomer, and detective all rely largely upon its aid.

Photography from the air is now employed for planning civic improvements and making surveys.

Photography in the Past. Scarcely more than 100 years have elapsed since the discovery of photography, and progress was extremely slow for the first fifty years. With the invention of the dry plate—for, prior to that epoch-making invention by Bolton and Sayce, the emulsion had to be wet—photography immediately became popular and

progress was extremely rapid, notwithstanding the difficulty of carrying about large and awkward cameras, heavy lenses of 30-in. focal length and other impedimenta. That was where large photographs were required, and it was considered wonderful to see the details of Nature picked out pin sharp in a way that would defy a painter to imitate. From our present viewpoint, these old photographs were anything but artistic or



IN THE EARLY DAYS OF
PHOTOGRAPHY
Descending a cliff with tripod

Photo: Cherry Kearton

true. The chief fault lay in the fact that the sensitive emulsion coated on the glass plates was not sensitive to the same bands

of the spectrum as those seen by the eye. The plates were not sensitive at all to red and yellow, but only to the blue of the visible spectrum. Worse than this, they were highly sensitive to ultra-violet rays, which are invisible to the eye. The renderings were therefore false, but in time people became accustomed to the photographic presentation, and, until less than forty years ago, accepted the harsh untrue tones as a convention.

One can readily understand that in a plate which was very sensitive to blue and not sensitive to other visible colours, the blue



BIRD PHOTOGRAPHY

In 1899 this photographer spent three days in a Scottish loch to photograph what is thought to have been the last osprey to nest in Britain (see illustration under OSPREY).

Photo: Cherry Kearton

of skies was not rendered at all, so that it appeared as white as the brightest sunlit cumulus cloud. The result was that where faint detail was occasionally visible in the shadows of nimbus, the skies were so unsatisfactory and so far removed from the clouds as we see them in Nature, that it was decided in photographic circles that the pictures were better without skies at all. The result was that a vogue persisted for many years of "blocking out" the skies entirely in the negatives, so that in all landscapes skies were shown as pure white, and during that period a photograph which showed any indication of cloud was not accepted as a good work. But clouds are an essential of most landscapes. The only occasion when they are unnecessary is when they are not present, even then, flat white is wrong. Gradually increasing depth of tone is required to simulate the air and space and charm of the azure dome.

Orthochromatism. Tones have now been put right. Skies can be rendered with almost any of the standard films or plates now sold by the photographic dealer, and these give a true indication of the form and beauty of the clouds against a tone which simulates

the vibrations of the blue sky. The reason is that the plates and films are sensitive to yellow, or orthochromatic.

Simplified Development. Another point which made the treatment of plates difficult in the old days was that the chemicals used in their preparation, and the reaction of the developer on them, were not properly understood. Their development was made a very complicated business indeed, adding a little



PHOTOGRAPHING CARRION CROW'S NEST
This is how Nature photography was carried out
with primitive apparatus.

Photo: Cherry Kearton

of this, adding more water, adding a little of that, and so on, according to the guess-work or experience of the photographer. In time, the professional or advanced amateur was able roughly to standardize his work, but for the beginner there were many disappointments. To-day practically all amateurs and many professionals now use single solution developer, which only requires mixing with a given quantity of water, and there is no guessing the time, or adding this or that, or attempting to judge the density in the coloured light of the dark room. The time at a given temperature is the same for all subjects of average contrast. If the subject is a flat one, which is to say lacking in contrast, one remembers to develop for, say, eight minutes to build up additional contrast, instead of five; if, on the other hand, it is a subject of extreme contrast, knows that one must pull it out of the developer after only three minutes or so, it is simply put in the fixer.

Simplified Exposure. Great improvement has taken place with regard to exposure. First: because the speed of the emulsions has been increased in the last thirty years by more than ten times, so that subjects can be taken in poor light which would have necessitated a tripod and time exposure in the old days. Second: because the emulsions have now so much latitude. Third: because fast lenses are easily obtainable. The only remaining pitfall, which, however, is avoidable is under-exposure. You cannot register detail which has not had time to affect the bromide of silver sufficiently; but thanks to modern latitude (given sufficient exposure), average subjects can now be exposed for no less than six or eight times as long as the shortest which will do, and still give perfect prints. Such negatives are ugly because they are very dense and slow of printing, but the range of contrast is right, and the print is all that matters. The latitude of the modern emulsions is so much greater than the tonal range of the average subject that it simply means using a higher section of the exposure curve, resulting in a dense negative of similar relationship of tones. At the same time, negatives of something like minimum adequate exposure are the aim, because they are convenient and give a good idea of what the print will be. Except with subjects of extremely long range of tone (which have little latitude) it is an excellent plan to give double or nearly double the meter reading, which should be regarded as a minimum, in order to allow for slight variation in film, shutter, or subject, and avoid all possibility of under-exposure.

Developing by Time Scale. Development time is based on a given duration, at a given temperature, with a given emulsion. Different emulsions vary in this requirement, so much so that useful time and temperature scales are printed, showing the relative times for the products of all the standard manufacturers and making development perfectly simple. One has only to take the temperature of the solution and see that it is maintained throughout the period of development, and there on the printed scale is the average time required for perfect development.

As suggested previously, flat subjects require longer development than normal, and subjects of strong contrast require shorter time. As much as 100 per cent increase, or occasionally even more, is given in the case of excessively flat subjects; indeed it is advisable in extreme cases to treat the film separately with double-strength developer, adding a drop or two of potassium bromide to restrain the shadows and prevent fogging due to forcing.

Relative Tone Values and Contrast. The truth of the tones of the negative, and consequently of the positive, are decided by the negative having received sufficient exposure. With very strong subjects this is an exact amount which is ascertained by an Exposure Meter. With ordinary subjects, especially with flat subjects, the exposure can be several times greater than the minimum and still yield a fine print. Contrast has

dark interior with bright passages, or for a portrait which required delicate treatment, he reduced the time from sixty minutes to thirty or forty minutes, and for a very flat subject, he developed it for ninety or a hundred minutes. This proved to be correct on a large batch of holiday negatives, with the exception that in the case of extremely flat subjects, these should have received more like a hundred and twenty to two



PHOTOGRAPH BY WIRE

Photograph of bridge at Cleveland, Ohio, transmitted by wire in May, 1924.

Photo - Wide World

nothing to do with exposure, as used to be believed. The contrast is decided by the length of time of the development of the negative, which builds in steps from quite weak contrast to a very long range indeed. Contrast, therefore, is easily under control, and that is why negatives should either be developed separately, according to the contrast range of the subject, or in batches which require similar treatment. When this was first discovered, the writer propounded and published through *The Postal Camera Club* the theory, which has since been accepted, that the correct time to decide on the relative length of time a negative should be developed is at the time of taking the subject. He was developing at that time by slow tank development with solution, and this dilute took, on the average, one hour. (It was a fashion to use such attenuated developer towards the end of last century.) For a

hundred minutes. Naturally the proportion was what mattered, not the difference in minutes. The computed time of development was marked on each dark slide when the subject was taken and the plates divided into batches, but a matter of 10 per cent has little effect, so that about 80 per cent of average negatives can be treated as normal and developed for the average time at one temperature. There is no need now to reduce the solution to such weakness that an average of an hour is required. About half that time is supposed to be right for tank development, which is a very convenient method and widely used in modern practice.

The Factorial System. At the end of the nineteenth century, Watkins revolutionized photography by bringing out the factorial system. This was a godsend, because it did away with all the old fiddling and guesswork

with chemicals. But the strange thing is that he said "it applies to negatives and not to prints." It only applies accurately to average subjects which have been correctly exposed, but it is not accurate otherwise, although it does give a large proportion of correct results. It has now been entirely discarded in favour of the Time and Temperature system, which is scientifically accurate. Fortunately, it does enter scientifically into the production

as the total time. Then a print is made on a fresh sheet of paper based on the information so gathered. To do this with every print would be a nuisance, and it is needless. Taking an average negative and making a perfect print by factor, it is fixed, dried and approved in white light, for white light gives the only reliable test. One cannot judge tones accurately in the dark room, or before the print is fixed or dried, although with experi-



PHOTO OF A NEGATIVE
Photo: Visual Education Service



PHOTO OF A POSITIVE
Photo: Visual Education Service

of fine bromide prints. With a given developer, the time which elapses before the first appearance of the image is multiplied by the factor of the particular developer, and that gives the minimum time of complete development. Less than that factor will give poor quality, but the factor is elastic in this way that double the lowest factor may be given with most standard brands of bromide paper, so that, when desired, a stronger image can be built up without fear of stain or fog and with the knowledge that all useful time has been given.

Time-saving from Use of Factor. The factorial system can be most useful if test strips are used, i.e. if strips of paper are printed under the negative or on the easel merely for trial, and an average time, say three minutes, taken, the time of the appearance of the image being noted, as well

once one can tell a good deal. But when one has ascertained how long that print has required to develop, the factor can be ignored, and the total time of development can be taken as suitable for *every print* made from the same batch number of printing paper. The batches do vary to some extent, so that it is advisable with each batch number to make a new test, using the minimum factor, noting the total time—say 2½ minutes, and twice that, say 5 minutes, or 5½ minutes as the possible outside—and then taking care to watch the dark room clock and to see that each print has not less than the first and not more than the second of those times. In that way, every bromide print should be a success, provided the grade of paper suits the negative. Never try to get flatter results by under-development, or strong results by over-development.

If a print is too flat when developed on this time system (which is based on factor), it is a clear sign that the negative is too weak in contrast (under-developed) for the grade of paper. The obvious remedy is to use a stronger grade of bromide paper. If the print is harsh, showing bare paper and coarse grainy blacks, then the negative has been developed too long for that particular grade of paper. It should be printed on a soft grade.

Classifying Negatives according to Contrast.

The way to get the best results possible out of a negative is to suit the paper to it and develop what is known as "fully," or within the confines of the lowest and highest factor. Always work with the middle grade, if possible, and develop your negatives to suit it. There is a grade of paper for every reasonably good negative, the one essential being that the development shall not fall below the minimum factor or time. Much that is misleading has been written about the development of both negative and positive, and we have even seen it in print that two minutes was sufficient to get the best quality out of bromide paper. We have never yet seen the bromide paper which gave its best in two minutes from an average subject. It is "that extra minute" which gives the velvety depth to the shadows, and which builds up the beautiful gradations of the facial high lights and the clouds of landscape. Fine prints look overdone by the darkroom light.

Different Developer for Prints. All development should be done as nearly as possible at

65°. If there is insufficient warmth in the room, then the best plan is to jacket the developing dish or tank in a large pudding-dish or other vessel. Fill this with water a few degrees warmer, say 65° to 70°. This will maintain the temperature, or it can be reinforced occasionally from a kettle if prolonged development is in question. But one can realize that in using factorial development, the temperature must not fall away or the factor is interfered with, because the developers all work more slowly at low temperatures; and with a developer which is very popular for making prints on bromide and gaslight paper, viz. Metolquinol, the quinol does not work at all at or under 58°, so it is well to give a good margin of warmth, otherwise weak prints of poor olive colour will be produced, without any quinol reaction whatever. While we recommend the single solution paramidophenol, which is supplied in concentrated single solution by manufacturers, for negatives, this is not a suitable developer for prints, because other developers, such as Metolquinol, Amidol and Adurol, are very much finer, being brighter and clearer in the images they produce. The concentrated one-solution developer does not make such a "pretty" negative as do the print developers, but one does not want a "pretty" negative, for such a negative never yields a fine print. No part of a negative should consist of clear glass: it should all be veiled, and this is why this concentrated developer is so very suitable. It seems to build up the shadow detail before



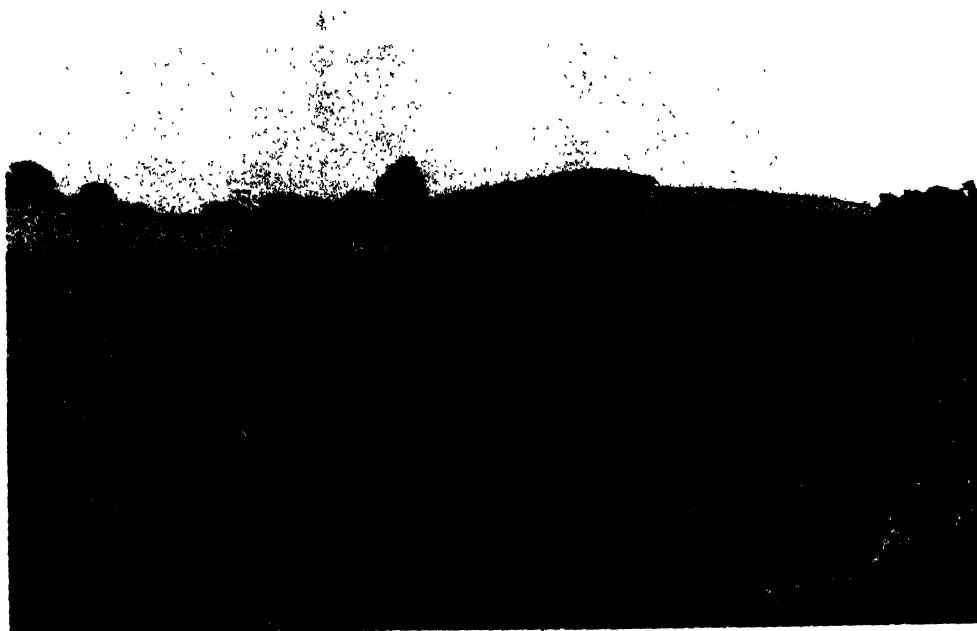
ANCIENT MANUSCRIPT

Left: Photographed in ordinary light. Right: With infra-red plate and filter

By courtesy of Iford, Ltd., and British Museum



VIEW TAKEN WITH ORDINARY FILM
By courtesy of Ilford, Ltd.



SAME VIEW TAKEN WITH SELO F.C. PANCHROMATIC FILM
By courtesy of Ilford, Ltd.

it forces the high lights. When laid on a printed page, one should be able to see the type through these negatives.

The above is but a fuller observance of the principles which are not generally put in print, but which enable the leading professionals and amateurs to produce the fine work seen at exhibitions.

Chloro-bromide Paper. A very large proportion of prints nowadays are on chloro-bromide paper, which is a modification of bromide paper, giving warm black, or brown-black to brown tones by direct development. This is a superior method to the sulphide toning of bromide paper for most subjects. Chloro-bromide paper has more latitude in the exposure and time of development than bromide paper, but the colour varies according to the time of development, and it requires more contrast in the negative, so that some experimenting has to be done before one is able to cultivate a fine technique. It has the advantage of a greater degree of transparency of the shadows than bromide paper, and so gives the effect of greater depth and contrast without hardness, for strong subjects especially, and it is often advisable to diffuse the image a little. This gives an artistic effect, so long as it is not overdone. The slight softening has the effect of wedding the light passages to the dark ones, so that one gets mellowness with strength—a greater degree of contrast and more power, without any suggestion of harshness. A very fine soft-sharp screen has recently been invented by a famous Belgian photographer. It is called the "Flou-net" or "Misonne soft-sharp screen," and is placed in front of the lens of the camera or enlarger. It gives very fine quality, retaining the sharp image or "drawing," the extent of the diffusion being under direct control of the operator.

Slow Contact Paper. The advantage of this is the great speed with which prints can be turned out, either as records or for handing round. Otherwise, bromide prints repay the extra time spent on their production. "S.C.P." is employed by most beginners and by the Developing and Printing trade for mass production. It is too slow for enlarging.

One point, not stressed by the makers, is of importance, viz. that development should be entirely by time. Given normal strength developer at 60° to 65°, development should take place in precisely thirty seconds. The print is then whipped out, given a momentary rinse and put face down as quickly as possible in the fixer, preferably acid hypo. There are "soft" grades for strong negatives, and for these it is usual to dilute the developer by 50 per cent and develop for precisely one minute. If the print be too light, it is underprinted; if too dark, it is overprinted;

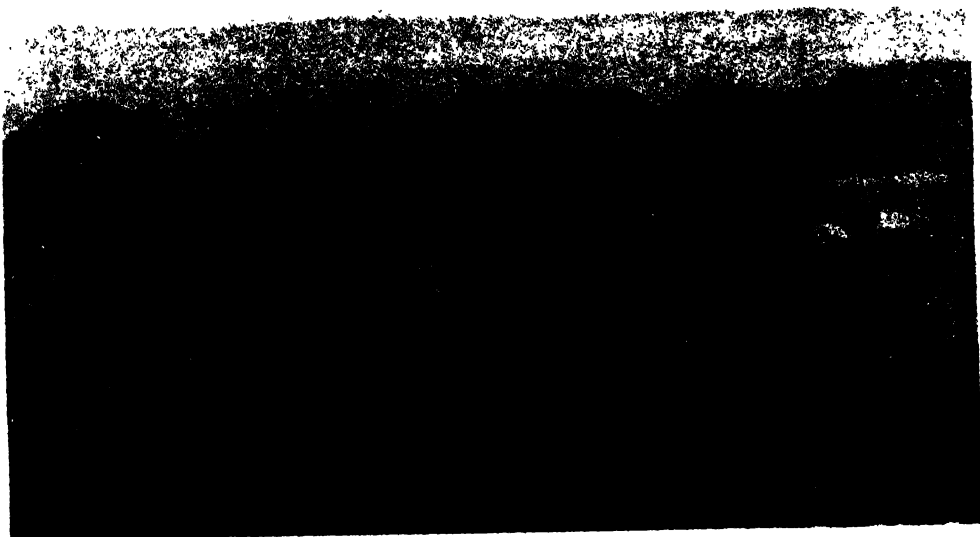
if too strong in contrast, too hard a paper has been used; if too soft ("flat") it shows that too soft a grade of paper has been used. Expose by means of magnesium ribbon in tin holders which measure inches and cost a few pence. Always expose at the same distance from the light.

True Colour Rendering in Monochrome. Mention has been made of orthochromatic emulsion, which makes the plates or films sensitive to yellow light, and hence the yellows and greens of Nature are rendered more truly than with the old "ordinary" emulsions, which were sensitive only to blue and ultra-violet light. One can understand that white clouds which reflect yellow light affect the plate more than the blue of the sky, which reflects practically no yellow light, so that the white clouds show out distinctly and the sky can be rendered naturally. In order to increase the effect of this, a filter is used over the lens, which shuts out the ultra-violet and some of the blue rays, thus giving greater relative value to the yellow. By this means, skies can be rendered very truly indeed. Yet one must be careful not to use too strong a filter, or the sky may be too strong in contrast to take its proper place in the landscape.

The "Chrome" Films. From these orthochromatic plates, a further advance has been made in plates which contain enough dye in the emulsion to take the place of the filter, viz. "non-filter" plates or films which give a true rendering through a bare lens. This grade of film is known as the "chrome" film, because several makers have adopted the syllable suffix "chrome" to describe it, such as "Selochrome," "Verichrome," and "Isochrome." It is a type of film which is to be strongly recommended, because it has several advantages over any other. Being sensitive to yellow and not to red, it can be developed in a red light. It is double-coated, that is, it has a layer of a very fast emulsion to pick up detail in dark shadows, and a layer of slow emulsion to render finely detail in the high lights, such as whitewashed cottages, cumulus clouds, high lights on faces, etc. It has another layer, a kind of incorporated backing, which prevents reflection from the back of the film, and so avoids halation. Halation is the spread of light which one so frequently sees where the sky seems to encroach on trees or buildings, but it enters more or less into all pictures where there is a bright passage reflecting sufficient light from the back of the glass or celluloid support to affect it. Many people imagine that the thinness of film avoids halation, but this is far from the truth with the high degree of magnification required by enlargement from small films.



VIEW TAKEN WITH HYPERSENSITIVE PANCHROMATIC FILM AND CORRECT EXPOSURE
By courtesy of Ilford, Ltd.



SAME VIEW TAKEN WITH ORDINARY FILM AND INCORRECT EXPOSURE
By courtesy of Ilford, Ltd.



Panchromatism. A still further advance, although it began long before the "chrome" films were marketed, is emulsion which is sensitive to all the colours, i.e. to red as well as to yellow and blue. These films give the truest monochromatic rendering of the tones of Nature. With a majority of subjects, the yellow sensitive emulsions are true enough, but where one wants absolute truth of tone, panchromatic emulsion is necessary. It has to be developed in the dark, and this is no hardship when one has become accustomed to time and temperature, which are the true factors of good development, and infinitely better than visual inspection, because the eye varies greatly in its receptivity of light, according to variable conditions. Beginners are perhaps better advised to keep off panchromatic work at first, but they will very soon take to it quite naturally, and for much commercial work, including the photographing of furniture, tapestries, and hundreds of other coloured items, the panchromatic film is essential. Only in such instances as when the green and red areas require to be contrasted, is it advisable to use an orthochromatic emulsion, because the only real weakness of the panchromatic plate is that a brilliant red against a brilliant green gives no contrast. The panchromatic shows great advantages, especially in amateur portraiture, because it renders the skin naturally, whereas the orthochromatic is apt to reveal subcutaneous irregularities and make the face spotty, so that the negative requires a considerable amount of retouching or even resurfacing, as with the old "ordinary" plates. The "pan" plate renders fair hair fair and blue eyes naturally, whereas the old "ordinary" plate used to make fair hair dark and blue eyes washy. With panchromatic plates it is generally advisable to use a light yellow filter for most subjects. A light filter which only increases the exposure by $1\frac{1}{4}$ times is sufficient, but for such work as copying oil paintings or reproductions, the tones of carpets, mahogany, and so forth, a heavier filter, yellow, or even green, involving longer exposure, is necessary.

Hypersensitive Panchromatic Plates and Films. During the last two or three years, a great advance has been made in the speed of plates and films by the introduction of a new type called "hypersensitive." These are ten or fifteen times as fast as the fastest films of twenty years ago. They are reasonably fine grain, so that they enlarge quite well and give a comparatively true range of tones; hence they are being used very freely for subjects in dull light, very rapid snapshots and scenes in twilight, or even at night. With a little help from street

lamps, snapshots can therefore now be taken at any hour. They are the best of all for child portraits in studio or elsewhere, or, in fact, for any restless subjects.

There is no special difficulty which need be experienced with hypersensitive panchromatic plates or films, save that they ought to be developed in the dark, a habit quickly acquired. The only difference is the greatly increased sensitiveness of the emulsion to all the colours of the visible and invisible spectrum. There is a loss of speed of not less than about 10 per cent. Once the negative has been immersed for, say, two minutes in the hypo bath, it can be inspected momentarily. Desensitizers can be used which enable one to develop by coloured light, but as the time and temperature system is more reliable than visual inspection, this is seldom necessary.

Infra-Red Photography. At the other end of the spectrum, pictures can now be taken by rays which the eyes cannot see. This innovation has already proved of enormous advantage in many ways. It does not give a true photograph according to human vision, because the rays which are called into action are not the rays which affect the retina. But they bring to light many things which the eye cannot see at all. They are thus of remarkable use in discovering forgeries by revealing differences of ink, etc. They show up variations in coloured fabrics which hitherto could not be detected by any means. The infra-red rays have tremendous penetrative power through mist, fog and even smoke. One places an infra-red filter over the lens in order to close out all other rays (the visible spectrum, ultra-violet, Hertzian, etc.), and the infra-red rays will pierce the filter and register the scene on the emulsion, so that a negative can be made and a print obtained giving the vision which we would see if our eyes were sensitive only to the infra-red end of the spectrum instead of to the short visible band. One effect of this is that it practically cuts out mist. Scenes can be taken at enormous distances, even hundreds of miles, showing the details of distant mountains. In thick fog which hardly permits the objects to be seen, a quite clear picture is obtained; a strange thing is that when the depth of fog is not deep, an effect of sunshine with cast shadows is recorded. On board ship, photographs during fog can be taken at intervals of ten seconds and each negative examined four seconds after exposure, so that danger of collision, rocks, etc., may be averted. The film is on a continuous reel, as in cinematography. A negative gives all the information required, and this is of a quick-developing kind in powerful solution.

Apparatus. There is no perfect, all-round camera—every camera is the best in its particular way. It depends on what it is desired to photograph, how the prints or enlargements are to turn out, and how much money is to be spent. Photography can be so inexpensive a hobby that it may be made self-supporting, or profitable, or it can be very expensive for those who have plenty of money to indulge in each new wonder camera. There is no need to do this. Cameras are so good nowadays that a majority of subjects can be taken well with a reasonably priced camera. By far the biggest number of cameras are built for roll film, but the roll film camera, with one notable exception, is the camera of the snapshotter, not of the ambitious photographer. The ambitious photographer may possess a roll film camera for casual work or for taking about with him, but for serious work he requires something different from the common type.

Roll film is extremely convenient. The films are developed in a tank all for the same length of time at the same temperature and give a good proportion of correctly-developed negatives. But this is not sufficient for the serious photographer, because every subject, to be rendered at its best, has its own development time.

The Reflex. The most popular camera among photographers whose aim is picture making is the reflex camera. This camera has a hinged mirror at 45° between the lens and the sensitive emulsion. This throws the view on to a horizontal ground glass on the top side of the camera. A hood is erected over this, and one sees the full-sized image right away up through the opening at the top of the hood. The image on the ground glass is so placed that it accords with the sensitive emulsion in distance from the lens, so that when the image is in focus on the ground glass it is also in focus on the plate or film immediately the mirror is removed. One presses the release, the mirror no longer obstructs the rays to the plate, and the focal

plane shutter is operated. This full-sized image the right way up is a great advantage to the pictorialist or portraitist, because it shows exactly what he will get on his positive, and he can focus moving objects and watch expressions until the very moment of exposure. The image on the ground glass is reversed (left to right), but to this one readily becomes accustomed, and it has no effect on the composition. The only objection to this type of camera is its clumsiness. To those accustomed to pocket instru-

ments, it is cumbersome. Many photographers use it in fairly large sizes for the studio, where it is particularly good for the taking of children. The most popular sizes, however, are $\frac{1}{4}$ -plate and $3\frac{1}{2} \times 2\frac{1}{4}$ in.

Twin Lens Reflex. A modification of the reflex is of recent growth and has bounded into popularity, viz. the twin lens reflex. This is a small or minia-

ture camera in which the reflex image is seen by means of a second lens placed above the operative lens. It gives a brilliant image with a magnifier, and the mirror does not interfere with the taking lens, so that a compur or other shutter can be used, instead of the focal plane. The advantage of this camera is its small bulk and the small expense of the films, because the usual size is 6×6 cm. and a smaller size 4×4 cm. It gives a square picture, and thus takes eleven or twelve pictures on an eight-exposure $3\frac{1}{4} \times 2\frac{1}{4}$ in. film. The square picture does exclude a few close-up subjects requiring more length. The films themselves are rather small, even at $2\frac{1}{4} \times 2\frac{1}{4}$ in., but they show what the negative will do, and every useful film can be enlarged automatically to postcard, $\frac{1}{4}$ -plate or any size up to 12×10 in. or 15×12 in., sometimes even larger, according to the care which has been taken to avoid grain in the emulsion. This is overcome by using fine grain developer and watching so that development is not forced too far. Also, with these small pictures more care than ever must be taken to avoid dust at all stages, because of the considerable enlargement.



DAFFODILS AND NARCISSI

Left: On ordinary film. Right: On Panchromatic film

By courtesy of Ilford Ltd.

One point with the twin lens reflex is that the image is not from precisely the same viewpoint as that seen on the ground glass, but the camera is very small and there is so little difference that there is not much trouble with what is known as "parallax," and it need only be considered with regard to close-up subjects within 2 or 3 ft. of the camera. These twin lenses are really miniature cameras. With large films the parallax would be inconvenient; consequently, with the large reflex, the same lens is used for both the finder and the photographic image.

Miniature Cameras. The most remarkable innovation of recent years has been the precision miniature camera. The Leica was the first to startle the photographic world. It has automatic focusing, a direct vision finder, where one actually looks through the camera and sees a slightly enlarged image, very clear and bright.

The ingenuity is amazing. One winds a knob. This puts a new film into position, sets the shutter, registers the number of the film, prevents a second exposure being made on the same film, and prevents one also from missing a film, so that in these respects the camera is fool-proof. These small precision miniature cameras are fitted with fast lenses of very high quality, and although they are small, they are of relatively long focus, so that the picture is not unduly foreshortened, but shows good drawing and the items in true scale. Some of the newer miniature cameras can have a whole battery of interchangeable lenses. One can spend a fortune on them, but this is not necessary, except to those who can afford such luxuries without feeling the pinch. The ordinary lens of the fast speed of $1/3.5$, which is not expensive in its small size, is sufficient for nearly all requirements, but for those who can afford an additional lens, one with three times the focal length would certainly be an advantage for photographing some subjects in large scale.

The contact prints of such pictures are useless. They are only $1\frac{1}{2} \times 1$ in., so that only such things as large heads can be seen at all conveniently. But they can be enlarged automatically to post-card size just as easily as ordinary plates or films can be printed by contact, the only difference being that the exposure must be carefully computed. The art of this one soon acquires, and one can reel off dozens of prints very rapidly, because the films are not separated but pulled into position. The film cost very little, about three shillings. It is standard cinematograph film allowing for thirty-six exposures and the cameras automatically count the films up to this number. Great enlargements have been made from these

tiny negatives. Newspaper files are no longer kept in some museums and offices, but contact prints are taken from these tiny films and filed. When one wants to read, one only has to project the tiny film to its original dimensions and there it is as clear as could be for anyone to read.

The problem at present is grain. There is a certain amount of grain in emulsions, and the scientists are busy all the time in reducing



PHOTOGRAPHING BIRD'S NEST IN 1892

Photo. Cherry Kearton

this, so that it has been largely overcome, and many fine pictures have been accepted by the major exhibitions which have been enlarged to, say, 15×12 in. or even 24×20 in. from these $1\frac{1}{2} \times 1$ in. negatives.

Exposure Meters. Exposure Meters are of many kinds. They are all good, and none is perfect. There are calculators where one mentally works out the conditions and generally comes very close to the accurate exposure required, and there are exposure meters where one pulls out a little bit of sensitized paper, takes the time that is required to match the standard tint, moves a band to suit the stop being used, and there is the exposure to give clearly marked. Then there is the Extinction Meter, which is a tube through which one looks and turns a milled ring until a number becomes visible, and according to this the exposure is clearly marked. The latest, the Photo-Electric Cell Meter kind, is the best of all, for it eliminates



HIGH-SPEED PHOTOGRAPHY: A RUBBER BALLOON IGNITED BY A BURNING CIGARETTE

The time from contact to bursting was twenty-six thousandths of a second. The photograph was taken with the Western Electric Company's ultra high-speed camera (see photo below).

the personal equation, the registration of the exposure being affected by the light reflected from the subject itself. Its weak point was that in dark interiors it was not effective, but this fault has lately been overcome by a fitting which can be added to one



ULTRA HIGH-SPEED PRECISION CAMERA

This is capable of taking up to 2500 pictures per second—about twenty times faster than the usual "slow-motion" film shown in the cinemas. Simultaneously it records action time which can be read to one-thousandth of a second.

of the meters, which multiplies the light several times and so gives an accurate idea of the correct exposure, even for subjects which previously could only have been by guess-work.

Natural Colour. One word about colour photography. This has been brought to a

wonderful degree of excellence by the chief manufacturers, but it is still on transparencies. Snapshots can be made in good light, and no filter is required. The results are wonderfully brilliant as compared with the old autochrome, which, however true in colour it may have been, was too dense to project well unless an inconveniently strong light was used, and even so the new films mark a great advance. They are very beautiful if projected, or in the hand when mounted, but a point which is not generally known is that if one wishes to make three-colour illustrations of anything pictorial or commercial, from a bunch of grapes to a desert scene, or a pattern of fine coloured fabric, a finer result is obtained if the three-colour blocks are made from a fine colour transparency than by direct photography from the objects. See **HALF TONE**.

History of Photography. Photography is generally believed to have been discovered in 1835 by Fox Talbot and Daguerre. These eminent scientists made it of practical and commercial value, but for the first known application of the principles one has to look as far back as early in the sixteenth century, when Daniello Barbaro made a huge camera within which the image of the subject was projected through a spectacle lens and traced. That was "drawing by light" and may be considered somewhat in the sense of the projection of lantern slides. The screen image was photography. The drawing was its permanent record.

For two centuries nothing more is heard until in 1727 Johann Schulze spilt by accident a solution of chalk and acids containing a trace of silver. The wet surface dried deep purple. He realized that the coloration was due to the action of light, but not the possibility, or practicability, of putting his discovery to use.

Seventy-five years later, in 1802, Tom Wedgwood and Sir Humphry Davy sensitized leather with silver nitrate and produced unfixed negative images of superimposed ferns and other objects. In 1819

J. F. W. Herschel discovered that hy sulphites dissolved silver chloride. Tl in 1822, Niepcé made important steps by inventing photogravure, attempting direct photography, and inventing bellows and cameras and the iris diaphragm. Many will be surprised that the last-named invention is over a hundred years old. In 1832 Charles Wheatstone experimented in stereoscopy, and in 1833 Chevalier produced a simple achromatic lens.

Then came Daguerre and Fox Talbot with their respective inventions in 1835. Talbot produced prints by contact on paper sensitized with silver chloride fixed with potassium iodide or by prolonged washing in a solution of common salt, resulting in positive prints which kept their appearance for a reasonable time. Daguerre made prints by developing the latent image produced by light on plates of silver, converting the surface into silver iodide.

In 1839 J. B. Reade produced photomicrographs on paper. These were negatives. In the same year H. Bayard produced direct positive images (silver chloride blackened by light and soaked with potassium iodide before exposure) and Herschel made first use of the word "photography" and intensified photographs with bichloride of mercury. In 1840 Draper took astronomical daguerreotypes. In the same year a notable advance was made in objectives—J. Petzval invented portrait lenses, this being the first occasion of the use of calculations in construction. Fizeau discovered gold toning. In 1841 Fox Talbot invented calotype paper negatives. Herschel discovered ferro-prussiate (the blue prints still used in engineering).

In 1847 Niepcé-de-Saint-Victor made albumen negatives on glass. In the same year the first photographic journal, *The Daguerreotype*, appeared.

Other years made memorable by inventions and advances are—

1851, F. Scott Archer invented the wet-collodion process, which is still in use, especially for "process," or block-making. Regnault used pyrogallol for development, hence "Pyro." Claudet: primitive movies, precursors of cinematography.

1852, Fox Talbot made bichromatized colloids insoluble when exposed to light. Attempts at half-tone blocks by means of tulle.

1854, Salted paper used by A. De Brébisson for positive printing.

1855, Davelle invented folding conical bellows of tourist cameras. Relandin: roller blind shutter. L. Poitevin: lithography. Attempts at carbon printing:

1856, aerial photography from a balloon.

1858, gum-bichromate printing.

1859, daylight enlarging camera. Bunsen and Roscoe: magnesium used for lighting.

1860, Fargier: carbon process.

1861, Clerk Maxwell originated three-colour photography.

1862, alkaline developers for reversal of negative image.

1865, Du Motay and Maréchal: collotype process.

1866, Steinheil: rectilinear lenses.

1868, W. H. Harrison: gelatino-bromide emulsion. Du Hauron: advance in three-colour photography.

1873, H. W. Vogel: first steps in orthochromatism. W. Willis: platinum printing paper. Johnston, Bolton, and Sayce: gelatino-bromide-emulsion on (dry) plates (marketed in 1874 by the Liverpool Dry Plate Co.).

1878, increase in sensitivity of emulsions by heating.

1879, Monckhoven brought about a further increase in speed by ammonia.

1880, Abney, hydroquinone developer.

1882, Berkeley: sodium sulphite as preserver in developers. Attout and Clayton: orthochromatic plates marketed. B. J. Edwards: focal plane shutter. Meisenbach: commercial half-tone blocks.

1890, F. Hurter and V. C. Driffild: scientific study of characteristics of sensitive emulsions; creation of photographic sensitometry. P. Rudolph and E. Abbe: anastigmatic lenses. Pictorial photography and equipment began to make enormous strides.

1891, A. Bogisch: metol, glycin and diaminodiphenol developers. Eastman Kodak Co.: roll films for daylight loading.

1893, Baekeland: slow-contact printing paper (silver chloride).

1895, W. C. Röntgen: X-rays and radiography. K. Klick: rotary gravure printing.

1898, A. and L. Lumière and A. Seyewetz ammonium persulphate reducer (reduces contrast) and panoramic camera.

1903, Eastman Kodak Co.: non-curling films.

1904, G. E. H. Rawlins, oil process.

1905, T. Manly: Ozobrome (now carbonyl).

1907, A. and L. Lumière: autochrome plates (natural colours). E. J. Wall and C. Welborne Piper: bromoil.

1908, G. A. Smith: colour cinematography. E. Belin: translation of photographs over telegraph or telephone line.

1911, R. Demachy: oil transfer process.

1912, L. Gaumont: three-colour cinematography by simultaneous optical synthesis.

1920, Lüppo-Cramer: de-sensitizing, allowing of developing in bright light.

1924, R. F. Punnett and S. E. Sheppard: discovery and identification of the active

constituent in gelatine, rendering possible great emulsion sensitivity. Since that date the speed of photographic plates and films has been multiplied several times.

Most of the foregoing particulars are taken from the appendix of *Photography—Theory and Practice* (Pitman), translated into English from *La Technique Photographique*, by L. P. Clerc.

PHOTOGRAVURE. Photogravure has developed rapidly of late, and while to a certain extent it may be regarded as a rival to letterpress and lithographic processes, there is room for all three, and gravure is making its own field of usefulness.

Photogravure printing-presses are rotary in principle, with forme cylinder and impression cylinder. The inking is comparatively simple as compared with letterpress and lithographic machines, the forme cylinder usually running either in the duct or in direct contact with the comparatively thin ink used. An indispensable adjunct to the inking is the doctor, or wiper, which scrapes away all the ink on the surface of the printing cylinder, leaving only the ink which remains in the "pits." These tiny pits engraved in the surface give up their ink to the paper on contact with the impression cylinder.

The forme or printing cylinder is either of solid copper, with prepared surface cleaned or re-prepared for each separate design for which it is used, or a cylinder bearing a thin copper plate accurately curved and attached to the cylinder. The plate itself is similar in general character to the usual half-tone engraved plate and used much as the plate on the offset or letterpress rotary.

The design is photographed on to the sensitized copper plate through a screen, which breaks the surface into minute squares uniform in size. Variation in tone is afforded by variation in screen depth, since, of course, shallow pits carry less ink than the deeper ones, with light and heavy impression accordingly.

The screens are considerably finer than those for letterpress half-tone, and permit of reproducing even the smallest type faces legibly.

The photogravure process is supreme for beauty and softness, depth, light and shade in pictorial reproduction. Though the process is chiefly seen in one colour, sepia shades being most popular, gravure in three and four colour is rapidly being perfected. Experts regard colour gravure as likely to oust all other processes for newspaper and magazine illustration, both from attractive effect and (in due course) from economy of production.

PHOTO-LITHOGRAPHY. See LITHOGRAPHY.

PHOTOMETRY, *fo tom' et re.* The science of measuring intensities of light by comparison with a standard unit. The brightness of the illumination depends on the source and its distance from the body illuminated. Various units are employed. The *British*



HOTOPHASE EDGE-CUMBE AUTO-PHOTOMETER
This makes direct measurement of light intensity.

standard candle, made of spermaceti, and of such a size that six candles will weigh one pound, was formerly in general use, but has been replaced by the *Harcourt pentane lamp* for scientific calculations. The British candle burns at the rate of 120 grains (of its

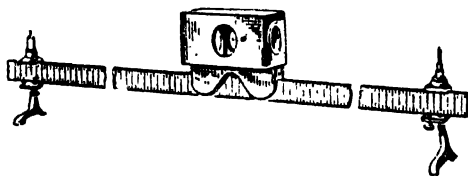


DIAGRAM OF A PHOTOMETER

A standard candle is placed in the holder on the left and the lamp for comparison on the right. Two screens in the photometer head reflect the light from these sources to the eye of the operator, who adjusts the distances of the sources from the photometer head until the brightness of the screens is even. The calibrated arms, along which the light sources are moved, enable the power of the lamp under test to be expressed in terms of standard candles.

own material) per hour. The Harcourt lamp, in which air is drawn over pentane (hydrocarbon of the paraffin series) and the mixture burned in a standard burner, has an illuminating power equal to that of ten standard candles. A more convenient standard is an electric incandescent lamp run at a specified voltage.

Photometers are instruments devised to make comparisons of illuminating power. In simplest form, a photometer consists of a white paper screen with a grease spot in the middle, arranged on a sliding scale between two lights. When the screen has been moved until the lights on both sides are equally intense, both sides of the screen will look alike. The law applicable here is that the strengths of two lights are proportional to the squares of their respective distances from an illuminated body. Where great accuracy for scientific work is required, a device called the Lummer-Brodhun photometer is used. Very sensitive instruments, which include a telescope and a polarizing apparatus, are necessary to compare the light of the stars and other heavenly bodies.

See LIGHT.

PHOTOSPHERE, fō' tō sfee'. See SUN.

PHOTOSYNTHESIS, fō' tō sin' the sis.

The main activity of all green plants is photosynthesis, or a building-up process, involving the absorption of light energy by chlorophyll, the green colouring-matter of all leaves.

In this way, carbon dioxide and water, absorbed through the leaves and roots respectively, are built up into complex plant products. These simple materials are apparently first converted into a reactive substance, formaldehyde, which rapidly combines with itself (polymerizes) to form sugars, starches, and finally cellulose.

Cellulose is the permanent structural material of the plant. Starch, on account of its easy breakdown into sugars, forms a food-store in tuber and root during early growth; while sugar, owing to its solubility, is the form in which food is transported in the plant.

Cellulose may be pictured as a long chain containing more than 100 links (each a sugar molecule); starch as a short chain of 12 to 30 similar links; and sugar as a single link or a chain of 2 or 3 links at most. Formaldehyde constitutes $\frac{1}{3}$ of a link. Cellulose is thus typical of complex organic compounds.

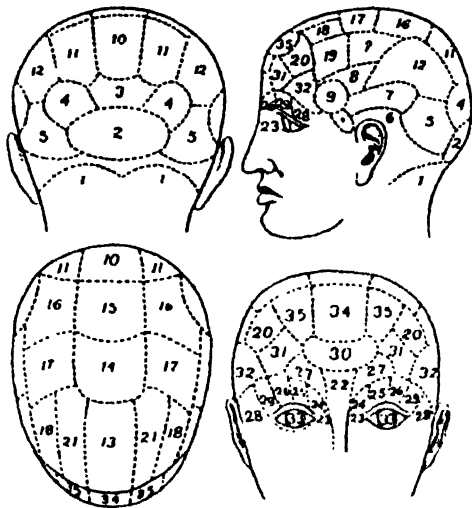
The plant absorbs through its roots not only water, but nitrates and many other simple things, and by combining them with formaldehyde and sugars, yields, by way of cellulose, wood, coal, food and countless other products, as well as the beauty and fragrance of the countryside. See BIO-CHEMISTRY; BOTANY.

PHRASE. In grammatical use, a phrase is a group of words forming part of a sentence and not containing a subject and predicate. It may be introduced by either a preposition or certain parts of a verb (infinitive, participle, gerund). A phrase has the function of a single part of speech, such as an adjective

or an adverb. Examples: (1) *Adjective-phrases*: The leader of the gang was arrested; The entrance to the hall was closed; (2) *Adverb-phrases*: He was standing near me; He came to wish me good luck.

PHRENIC, fren' ik, NERVE. See DIA-PHRAGM.

PHRENOLOGY, fren ol' o je. A so-called science which grew out of a false interpretation of facts revealed by the progress of



PHRENOLOGICAL CHARTS

AFFECTIVE

- | | |
|---|--------------------------|
| I.—PROFENSITIES | II.—SENTIMENTS |
| (1) Amativeness | (10) Self-esteem |
| (2) Philoprogenitiveness | (11) Love of Approbation |
| (3) Inhabitiveness or Concentrativeness | (12) Cautiousness |
| (4) Adhesiveness | (13) Benevolence |
| (5) Combaticiveness | (14) Veneration |
| (6) Destructiveness and Alimentiveness | (15) Firmness |
| (7) Secretiveness | (16) Conscientiousness |
| (8) Acquisitiveness | (17) Hope |
| (9) Constructiveness | (18) Wonder |
| | (19) Ideality |
| | (20) Wit |
| | (21) Imitation |

INTELLECTUAL

- | | |
|----------------|------------------|
| I.—PERCEPTIVE | II.—REFLECTIVE |
| Individuality | (30) Eventuality |
| Form | (31) Time |
| Size | (32) Tune |
| Weight | (33) Language |
| (26) Colouring | |
| (27) Locality | |
| (28) Number | (34) Comparison |
| (29) Order | (35) Causality |

anatomy and physiology in the early nineteenth century.

Phrenology began with the observation of Franz Gall that men with certain prominences of the skull possessed definite qualities in marked degree. He observed the heads of students and related their proficiencies with their "bumps," and thus

discovered the "organ" of *number* in mathematicians, of *tune* in musicians; he observed the devout at church and located the "organ" of *reverence*; he observed poets and located the "organ" of *ideality*; and so on.

In the light of modern knowledge, division of the brain into such areas is proved false. The sciences of physiology and psychology have established that there is division of functions among the portions of the brain, but that it is a division between sensory and motor areas, with "centres" for the prominent functions of correlation of impressions with impulses, such as writing and acts of skill, all of which involve intelligent conduct.

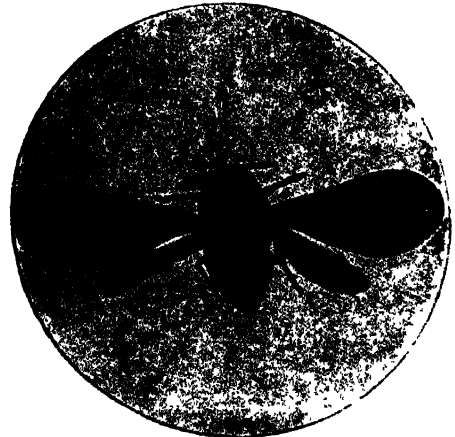
PHRYGIA, *frij' ia*. In ancient times, a country in the west-central part of Asia Minor (which see). Eventually, it became a part of the Roman Empire, and for purposes of government was divided, the north-eastern portion becoming a part of the province of Galatia, and the western a part of the province of Asia. Gold and marble were once important products. The Phrygians probably entered Asia Minor from Thrace, and were of an Indo-European stock, related to either the Greek or the Teuton race. They were a peaceful people whose main occupations were cattle-raising and agriculture. In legend, Phrygia was the home of a race of powerful kings, including Gordius and Midas, whose great rock-hewn tombs can still be seen in the mountains.

PHTHISIS, *thi' sis*. See TUBERCULOSIS.

PHYLLODIA, *fil o' dia*. See ACACIA.

PHYLLOXERA, *fil ox air' a*. A species of green fly that attacks grape vines. In the middle of the nineteenth century, it was

which it spread also suffered enormous losses. The phylloxera attacks either the leaves or the roots of the vine, but it is the latter form of attack that causes the most



THE WINGED PHYLLOXERA INSECT

serious injury. As nearly all American vines are more or less free from root attacks, and European vines suffer from them more than from leaf attacks, the ravages of the insect are best prevented by grafting European varieties on American stocks. See GRAPE.

A closely related species is found on British oaks but apparently does little or no harm.

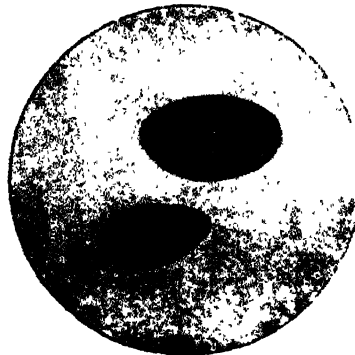
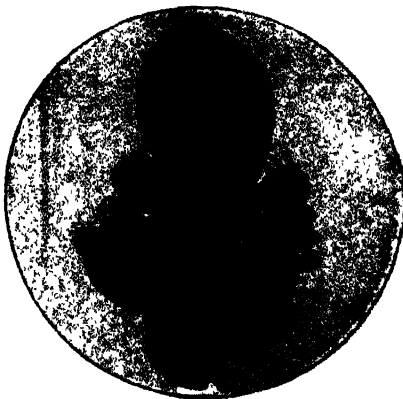
Scientific Name. The phylloxera is one of the insects called *aphides* (which see). Its scientific name is *Phylloxera vastatrix*.

PHYLUM, *fi' um*. In biological science, a primary division of plants or animals. See CLASSIFICATION.

PHYSICAL EDUCATION. Physical education aims at balanced development and the maintenance of mental and bodily conditions that will resist disease, preserve good health, and enable the mind

and body to function at the highest pitch.

Modern conditions tend to impose nervous strain, whilst the use of machinery



WINGLESS FEMALE PHYLLOXERA AND EGGS

carried to Southern France upon native American vines. There its ravages caused the destruction of one-third of the vineyards; vine-growers in other parts of Europe to

discourages bodily effort. Physical education tends to counteract these influences, and is an important adjunct to present-day civilization.

Methods. As the body is being built up during its early years, this is a vital period. From an early age the child's urge for unfettered movement is limited by modern conditions at home and school. Restriction needs to be compensated by exercise; this may begin, under parent's or teacher's care, from the child's earliest years.

In preparing a scheme of physical training, age and sex are considered, but as regards children, the stage of growth forms a better



PHYSICAL TRAINING

An important item in the curriculum of the schools.

Photo: Photopress

guide than age. Those reared in distressed areas are likely to be backward; their training needs to be adapted to existing defects. Modified training suited to these special conditions serves to eradicate defects and restore harmonious development.

So, too, must exercises be adapted for adults of differing ages. The sharp, rapid movements beneficial to the youth of unimpaired physique would impose harmful strain on the middle-aged, whose limbs and joints lack their former elasticity and flexibility.

Effects on Physique. The physical results of correct training are (1) improved efficiency and activity in the limbs, glands and other organs; (2) correction of defects; (3) balanced development.

(1) Walking, running, jumping, skipping, dancing, and games involving the use of the whole bodily structure benefit the digestion, respiration and circulation. With good food and fresh air, these movements are essential to the building up of a sound body. Organized games will counteract sedentary study. The natural movements used in games are supplemented by arm, trunk and leg exercises, whose deliberate performance aids the nervous system by calling for definite control by the brain through the nerves.

(2) Corrective exercises are framed to remedy specific defects. Mouth-breathing is corrected by lung exercises. Controlled breathing also quietens excitability. The

criterion of a well-developed chest is not its size expanded to the utmost, but the difference between its measurements full and empty.

Round shoulders, narrow chests, drooping heads, are corrected by trunk, shoulder and neck exercises; flat feet by heel raising.

(3) With the growth of the child's body, the brain-cells develop. The baby's control over his limbs is uncertain, but growth brings fresh nerve-centres into action until eventually a wonderfully precise control is possible—when, for example, the surgeon performs a delicate operation. Physical education assists co-ordination of brain and muscle. Exercises involving precision of movement are not, however, imposed on the young child, or undue fatigue will ensue.

Mental and Moral Effect. As all limb movements are directed by brain-cells, physical training has a mental as well as a bodily effect.

Benefit to the mind is assured, provided exercises are devised to evoke interest and enthusiasm; and provided, too, they progress in difficulty. Repetition leads to mechanical performance, and the exertion of perceptible mental effort is lacking. Yet strain must be avoided. Exercises taken



TABLEAU DURING ARMY TRAINING EXERCISES

Photo: Fox

when mind and body are not already fatigued will prove most beneficial.

Memory, quickness of perception and response, control, endurance and determina-

tion are qualities strengthened through physical education. Organized games promote unselfishness and co-operation—the "team spirit."

To the satisfaction of accurate and precise performance of a variety of exercises is added appreciation of form and movement.

Relation of Physiology to Physical Exercises. (1) *The Muscles and Bones.* Muscular energy is produced at the expense of the tissue composing the muscles. Waste products also resulting are carried away by the blood stream. The presence in the blood of these impurities, and their reactions on the brain-cells controlling the heart, cause the latter to beat (or pump) faster. The increased supply of blood provides nourishment to replace the tissues of the muscles, which become capable of utilizing additional nourishment. Exercise thus adds to the strength of the muscles, including the heart muscle itself, and eliminates obstacles (fat or other unnecessary tissue) to its power to contract.

The bones and joints also gain by the increased blood supply, the former becoming larger and heavier, giving a strengthened bodily framework; the latter being rendered more flexible and capable of withstanding strain.

There are, however, limitations to the restoration of condition by the blood stream. Continued activity will produce more waste products than the blood can eliminate, with a resulting accumulation of poisonous products in the energized muscles. Not only are the muscle fibres affected, but the ends of the nerves located in the fibres will suffer. Eventually the muscle will fail to contract. This state of extreme fatigue or overwork may be cured by resting sufficiently to allow the blood to remove waste products and replace lost tissue. Inadequate rest shows itself by reduced power and endurance in the muscles affected. Continued excessive use of fatigued muscles causes serious impairment of the muscles themselves, and further, the impure blood stream will have an adverse effect on the whole body, weak-

ening its resistance to disease and decreasing its power for mental or physical exertion.

The "stiffness" in a muscle noticed after unaccustomed exercise is attributable to the presence of waste products and probably also to temporary slight damage to the muscle fibre.

(2) *Breathing.* The effect of impure blood on the brain-cells governing the lungs' action is deeper and quicker breathing. The increased supply of oxygen to the lungs assists in cleansing the blood. Exercises taken in fresh air and specially directed to the promotion of regular and deeper breathing have thus a general beneficial effect.

The discomfort noticed when unusually vigorous exercise is taken is due to the effect on the brain and lungs of the abnormal load of impurities carried by the blood.

Through increased powers, acquired by correct training, heart and lungs become capable of overtaking and dealing with the early accumulation of waste products. They will, as it were, "get into

their stride," and the breathlessness noticeable in the early stages of violent exertion will soon pass and the "second wind" be gained.

(3) *Perspiration.* Muscular exertion causes heat and a flushed condition of the skin, brought about by the higher pressure and volume of blood circulation. Surface cooling is assisted by the outflow of perspiration, which furthermore eliminates impurities. At the completion of the exertion, damp clothing, which should be light and unrestrictive, must be changed to avoid excessive cooling and chills.

(4) *Digestion.* The improved circulation of the blood which exercise brings has a beneficial action on the digestive organs, giving a keener appetite. The strengthening and invigoration of the intestinal muscles leads to efficient functioning and prevents constipation.

As food digestion calls for an increased blood supply to the organs concerned, vigorous exercise soon after meals should be



INSTRUCTOR'S CLASS AT THE ARMY SCHOOL OF PHYSICAL TRAINING

Photo: Fox

avoided if blood needed for digestion is not to be diverted to the limbs.

(5) *Nerves*. The repeated performance of varied exercises develops and perfects the control of the muscles by the brain-cells through the nerves. Response to the brain's direction becomes more accurate and efficient, reducing the expenditure of energy and avoiding unnecessary fatigue.

Conclusion. Physical education, then, aims neither at the production of bulging muscles nor at the creation of a gymnast, but is directed to improving the efficiency of mind and body, and imparting a sense of general well-being.

PHYSICAL GEOGRAPHY. A division of geography that deals with the physical phenomena on the surface of the earth. It is not concerned with the distribution of plant, animal and human life, but has to study the conditions which influence these. In practice, however, the distribution of vegetation is often studied under the heading of physical geography. All political divisions and human activities are outside its scope. Physical geography is descriptive as well as explanatory, and thus may be considered a scientific study. Originally developed by the geologist, it is now considered in the main to belong to the province of the geographer as the foundation of his subsequent human studies, but the geographical aspect differs from the geological inasmuch as the former pays more attention to land forms than to geological structure, and is also concerned with the study of the atmosphere.

Physical geography treats first of the earth as a whole—its shape, size, movements, relation to other bodies in the solar system, and its structure. The atmosphere, which envelops the globe on all sides, is another division of this branch of geography. Included in this division is the study of the composition of the air, its pressure and elasticity; the effects of variations in temperature; the movements of the air; the seasons, zones, storms, rainfall, snow, and kindred topics. The land and water envelopes of the earth are also studied in detail in physical geography. This science treats of the depth and area of the various ocean divisions, of the colour, temperature and composition of ocean waters, of currents, tides and drifts, of the contour and characteristics of the ocean floor, and of the formation of continental shelves. Seas and lakes are also studied. In considering the land surface of the globe, one would study the character, position, and formation of continents, plains, plateaux, mountains, rivers, valleys and islands. At all times, through the work of heat, atmosphere, and running water, and through other agencies,

the appearance of the earth is undergoing many changes. It is the province of physical geography to investigate and classify the forces of change and to study their effects. See GEOGRAPHY; GEOLOGY.

PHYSICS. The word "physics," which is derived through the Latin from the Greek *physis* (Nature), suggests the study of the whole of natural phenomena. Actually, by convention this vast field of study is divided into (a) the biological sciences, which deal with the phenomena of living matter or of matter which has once lived, and (b) the physical sciences, dealing with inanimate Nature. The physical sciences in turn are subdivided into a number of branches, for example, physics, chemistry, astronomy, meteorology and crystallography. The distinction between these sciences is one which is best appreciated from even a slight acquaintance with them, but broadly speaking, it may be said that physics is the study of energy and the relations between matter and energy.

How Knowledge of Physics has Grown. Some isolated facts of physics were known to the Greek philosophers, but its systematic study dates only from about the time of Galileo, since when it has continued over an ever-broadening front until the present day.

It is only within the last two or three generations that the man in the street has been led to take an interest in physics. This arises from the joint action of several causes. In the first place, University training in physics has been revolutionized since the date when Lord Kelvin (who died as recently as 1907) established one of the first physics laboratories in the country for the teaching of students, after having had to go abroad for his own training in experimental work. This development was followed by the provision of physics laboratories in all Universities and a few pioneer schools, until now they are part of practically every public, grammar or secondary school in the country.

Physics as a Servant of the Community. Partly owing to this wider appreciation of physics and partly owing to the necessity of keeping up with foreign rivals, many industrial firms now employ physicists to assist in research and manufacturing processes.

The Government is among the large employers of physicists, many of whom are engaged in work for the Army, Navy and Air Force. Others serve either in laboratories maintained by the State, such as the National Physical Laboratory, the Building Research Station, the Fuel Research Station, and the Forest Products Research Laboratory, or in the Research Associations which have been set up to assist particular industries

and are run, with financial assistance from the Government, by the collaboration of firms in that industry.

The first-named institution, which employs about 600 people, of whom about 160 are trained scientists, has a twofold purpose. In the first place, it investigates problems which concern fields of industry so specialized and wide that they do not readily fall within the province of Universities, private workers or research associations. In the second place, it acts as a standardizing laboratory where instruments for measurement of length, volume, mass, weight, pressure, temperature and many other physical properties may be checked for those who are to use them. That such a laboratory is essential will be realized if we reflect that although an error of several per cent (say an inch) may not be serious in measuring a yard of cloth, yet a 1 per cent error in the diameter of a bolt intended to fit into a half-inch hole (i.e. half a hundredth of an inch) would be sufficient to make it a bad fit. Evidently different manufacturers must be able to attach exactly the same meaning to such words as an inch, a gallon or a pound.

Uniformity in Measurement. This has been secured by the Act of Parliament which specifies that a yard is the distance between two lines scratched on a certain rod, and that a pound is the weight of a certain block of platinum. The legal definition of a gallon is the volume occupied by ten pounds of water. Such legal standards are, of course, useless if they are not compared with the measuring rods and weights actually in use, but it is evident that they are too precious to be handled by all and sundry at frequent intervals. The difficulty is resolved by the National Physical Laboratory, one section of which is largely devoted to accurate measurements of mass, length and volume. The laboratory has frequent access to the legal standards, with which it compares its own best standards. These are periodically compared with the working standards, against which lengths and weights for the public are checked. The accuracy attainable in this work may be assessed from the fact that gauges can be measured to within a millionth of an inch, whilst with one of the balances in use, a single human hair gives a very considerable deflection. In the case of the metric system, there is a corresponding set of standards which are in the custody of an international body, the *Bureau des Poids et Mesures* at Sèvres, near Paris. The National Physical Laboratory, like its counterparts in America, Germany and other countries, maintains close touch with this Bureau.

Subdivisions of Physics. Although physics

is but a small section of the physical sciences, yet it is sufficiently broad and complex to be subdivided further, the customary sections being Heat, Light, Sound, Magnetism and Electricity and General Physics; reference may be made to the articles under the first five titles. Heat is a parent of that important part of engineering which deals with steam and petrol engines; without the science of light, the optician would be unable to pursue his beneficent labours, and the present efficient distribution of illumination in factories and drawing offices or on the roads would be unknown; sound (or acoustics) has only come to the front as an applied science in recent times, largely owing to the development of the talking film and the radio loud-speaker—a striking contrast to the Cinderella position of acoustics a few years ago. The magnitude of the electrical supply industry is too well known to need emphasis, but it may be worth while to point out that general physics, especially that part of it which deals with mechanics and elasticity, is the foundation of civil engineering, and that without it we could have no safety in ferro-concrete buildings nor on bridges, we could not calculate the load which a girder could bear, nor how many rivets to put at each joint, whilst we should not even know how thick to make the wheel of a locomotive designed for running at, say, 70 miles per hour.

Structure of Matter as Revealed by Physics. Almost every branch of physics has contributed to show that matter is not continuous, but that if we proceed to subdivide it far enough, we come to particles so small that they can no longer be subdivided, at any rate without changing the nature of the material. Thus a drop of water might in imagination be halved and then halved again and again, but eventually we should reach the smallest possible quantity of water, one *molecule* as it is called. Any further division results, not in water, but in hydrogen and oxygen, each in its smallest possible quantity, an *atom*.

At least a score of different ways of estimating the size of a molecule have been devised, and all lead to approximately the same answer, so that we may have considerable confidence in the truth of the estimates. The methods include X-ray examination; a study of the spectrum of light; the colours of soap bubbles; the force needed to drive gases through narrow tubes; measurements of the radiation from a glowing body; measurements of the electric forces on a charged drop of oil, so small that it falls but slowly in air; and many others. Probably the simplest of all is based on the fact that tiny particles of camphor dance about when

placed on the surface of clean water in a dish, but that this action stops if the water is covered with oil. Lord Rayleigh placed a carefully weighed single drop of oil on a clean water surface, and examined how far it could spread without losing the power of calming the motion of the shreds of camphor. Knowing the area of this patch of oil and also the total quantity, he could calculate the thickness, which is that of one molecule, since it represents the thickness of the oil patch when extended to its utmost. Another slightly more complex method is founded on the interesting fact that small particles of solid (gamboge was actually used) when floating in water, are seen through a microscope to be in continual agitation. This is due to the bombardment of the particles by the individual molecules, and is regarded by physicists as a direct proof of the existence of molecules. Intricate calculations allow the size and number of the bombarding particles to be deduced from the observed irregular motion of the solid particles.

The results are by now well-known. The diameter of a water molecule is about

$\frac{1}{1,000,000,000,000,000,000}$ of an inch, and it takes 1,000,000,000,000,000,000 of them to weigh one ounce.

Structure of the Atom; Electrons and Nuclei. Towards the end of the last century, Sir J. J. Thomson, the Cambridge scientist, and others found that electrified particles could be obtained from matter in various ways, and that these particles all had the same electric charge and the same mass, which is about $\frac{1}{1836}$ of that of the lightest atom. They soon became known as (negative) *electrons*, and are regarded as electricity divorced entirely from matter. The residue of the atom, from which an electron has been detached, does not differ greatly in properties from the original atom, and it has been deduced from this and other arguments that an atom must consist of a small central *nucleus*, responsible for almost all the mass of the atom, together with a swarm of electrons revolving about it, somewhat in the way that the planets revolve about the sun. The size of an atom, to which we referred above, is, of course, that of the orbits of these electrons. Information on the nature of the nucleus has been obtained largely from the phenomena of radioactivity, which was discovered by Becquerel at about the same time as the electron. It was found that certain elements, such as uranium and radium, continually emit radiations which can pass easily through matter. Of these radiations, the *beta* particles are electrons, while the *alpha* particles consist of atoms

of the element helium, which are positively charged. They can only have come out of the nucleus of the radioactive atom, and when this happens, the latter changes its nature and becomes an atom of some other element, which may in turn disintegrate. The ultimate product of the series of changes is found to be lead. The alpha particles can give information in another way: if they are directed among the atoms of another element, they will occasionally strike the nuclei of the latter, and will be deflected so as to emerge in some other direction. Observations of this scattering, again aided by mathematical reasoning, enable us to calculate both the charge and the size of the nucleus, with the result that we know the nucleus to be almost incredibly small—only $\frac{1}{100,000}$ of the diameter of the atom itself.

Even the nucleus, the very heart of the atom, is now beginning to yield up its secrets. In 1919, Lord Rutherford succeeded in observing the occasional emission of hydrogen nuclei from the nuclei of heavier atoms when bombarded with alpha particles, and more recently a whole "chemistry" of transmutation has been developed. Atoms are speeded up in intense electric fields and are then allowed to bombard other elements, when in many cases the bombarded nuclei break up and give rise to new products. All these products are atoms of familiar elements, but some occur in hitherto unknown varieties, several of which are radioactive. Among these new radioactive atoms are a number which emit, not alpha particles but positive electrons, particles only discovered about three years ago and consisting of disembodied positive electricity with the same mass as negative electrons. Another particle only discovered in the last four or five years is the *neutron*, a particle of nearly the same mass as the hydrogen atom, and bearing no electric charge. It occurs in many nuclei, and possibly results from the close union of a hydrogen nucleus with a negative electron.

Utility of Physics. These discoveries appear remote from daily life, and while this may be so, it provides no argument why such work should not continue. The reasoning powers given to Man were obviously intended to be exercised in finding out all that he can about the environment in which he is placed. Even on the lower plane of pure utilitarianism, it would be foolish to dismiss any scientific discovery as useless. The first recognition of the electron as a constituent of matter appeared to be a piece of very academic science, but without it, the thermionic valve could not have been invented, and wireless would have been shorn

of many developments. The fact that light can eject electrons from certain metals is the obscure scientific fact which has made the "talkies" possible, whilst the discovery of radioactivity has provided the medical profession with an unexpected weapon against cancer. No one can visualize what will follow from the discoveries in atomic physics which have taken place in the past five years and are still in progress. Incidentally, the effort to transmute the atom has not resulted in the gigantic explosion that would wreck the earth, as certain scientific prophets have suggested. It may—though this is more doubtful than it seemed a few years ago,—put into our hands a source of power that will dwarf our present ones, and it may give us new radioactive elements which may even be more useful in medicine than the natural elements.

PHYSIOGNOMY, *fiz i og' no mi*. A pseudo-science which attempted the specific task of reading traits of character in bodily signs. It became a pseudo-science by far overstepping the bounds within which such relations might be moderately suggestive. In the treatise on the subject attributed to Aristotle, the essential doctrine is found. Such qualities as timidity, impudence, courage and anger are associated with colour, hair, form of body, length of limb, gait, voice, etc. Persons with thick, bulbous noses are insensitive; those with sharp-tipped ones, irascible; those with slender, hooked noses, noble but grasping, etc. Animal analogies were common. A person with a nose like an eagle's beak was put down as having the qualities of an eagle, the one whose appearance suggested an owl was wise, and he who looked like a crow was pert.

Rash generalization, on the basis of weak analogy (and supported by a certain amount of shrewd observation), is all that underlay the earlier system, unsupported by science.

The true scientific view of the meaning of features and expression began with the treatise of Sir Charles Bell (1806), and was markedly advanced by the work of Darwin (1872), who showed that with expressions of the emotions were associated serviceable habits, once really useful, and now refined miniatures, suggestive of their ancient service. Thus we sneer and raise the lip, while the dog snarls and shows his teeth as a threat. Naturally, the tendency to assume certain types of expression, notably fear and anger, may give a set to the features.

PHYSIOGRAPHY, *fiz i og' ra fi*. A term used to cover the entire range of the science of physical geography (which see).

PHYSIOLOGY, *fiz i ol' o ji*. Human physiology is a study of the functioning of the various organs of the body. It studies not

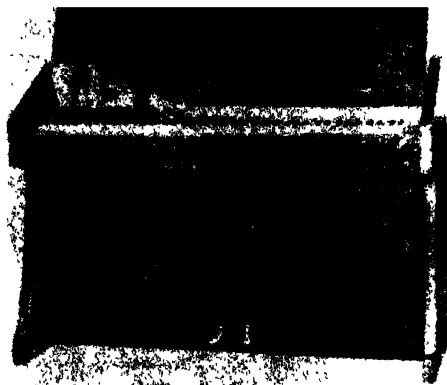
only the relations of the functions of the organs to one another, but also the effect of outside environment upon the organs of the body. In other words, a study of physiology makes clear to us the mechanisms by which we live. Thus anatomy and physiology are two of the most fundamental sciences in the study of the human body, and one is not complete without the other.

The early history of physiology is obscure, but we know that for many centuries the practice of medicine was founded more upon tradition and superstition than upon scientific facts. Gradually, however, superstition gave place to scientific knowledge. Modern physiology began with the discovery of the circulation of the blood by Sir William Harvey in 1628, since this discovery worked a revolution in most of the accepted theories then underlying medical practice. The next great discovery was that of the lymphatic system in 1651. Since the discovery of the cell structure of tissues, physiological science has made rapid advances. See also BIOLOGY.

PHYTELEPHAS, *fi tel' e fas*. The tree which produces the nuts of vegetable ivory.

PIA MATER, *pi' a may' ler*. See BRAIN.

PIANOFORTE. A keyboard instrument, and the most important of the instruments of percussion (see INSTRUMENTS, MUSICAL).



MODERN MINIATURE UPRIGHT PIANO
Photo: John Broadwood & Sons, Ltd.

Keyboard instruments are of three classes. In the *Harpsichord* (which see), the keys operate a series of plectra by which the strings are *plucked*; volume is not greatly controlled by the touch, but may be regulated by stops or pedals. In the *Clavichord* (which see), the keys operate tangents by which the strings are simultaneously struck, *measured off* at the correct length, and *held* at correct tension throughout the duration of each note; volume and character are

controlled by the player's touch throughout; maximum volume is soft, but minimum volume is correspondingly softer still, and full contrast is available. In the *Piano*, the keys operate, by means of an elaborate mechanism, hammers which strike the strings and immediately rebound; volume is controlled by the touch at the moment of impact, maximum volume being very great. The operating mechanism is termed the *action*, and includes devices for securing rapid repetition, and for damping the vibrations so soon as the key is released. The whole series of *dampers* may, however, be withheld at will by the use of a damper-raising or "loud" pedal—so called because when the dampers are not in action, all the remaining strings of the instrument are free to sound in sympathetic vibration with those of the notes actually struck; the result being an access of resonance, together with a decrease in clarity. The "soft" pedal causes the hammers to miss two out of the three strings with which each note is provided and to strike only a single string for each note, thus automatically decreasing the volume by more than half. The total compass of the concert grand piano is 7½ octaves. Upright pianos may have a somewhat shorter compass.

The oldest surviving piano appears to be one dated 1610, probably of Dutch origin (collection of M. René Savoye, Paris). It has an action of the type known as Viennese but no dampers. The pianos of Bartolomeo Cristofori, long reputed to be the inventor of

ing one of the piano, in a MS. written between 1425 and 1430 (MS. Latin No. 7295, Bibliothèque Nationale de Paris, translated



MODERN "BABY" GRAND PIANO
Photo: Chappell



PIANO BUILT IN 1720 BY CRISTOFORI
Photo: Metropolitan Museum of Art, New York

the piano, are a century later in date. But references to pianos are found at far earlier times, the most important being a full description, with diagrams of each of the three types of keyboard instrument, includ-

by G. Le Cerf). The principle of the piano is thus of great antiquity. But its development is essentially modern. Silbermann, working possibly on Cristofori's model, made pianofortes which J. S. Bach condemned as weak in the treble and heavy in touch. Haydn and Mozart were brought up on the harpsichord, but they knew and used the piano increasingly; much of their music is more often for the piano of their time (a less powerful and more clear-toned instrument than ours) than for the harpsichord. The earliest true piano music is by their contemporary, Clementi. But it was not until Beethoven's great series of piano sonatas, spread over his whole productive period, that the instrument formed a characteristic literature of the first importance. Schubert's music is of the same period and includes not only sonatas but also a lyrical use of the piano as an accompaniment for innumerable songs. Schumann, Chopin, Brahms and Wolf, in developing the pianistic tradition, set each a personal stamp upon its development. Later developments include the further strengthening of the frame (now made entirely of metal) and the thick-

ening of the strings. The resulting gain in volume has been achieved at the cost of an increased difficulty in combining clear outlines with warmth of tones, whilst enabling the piano to compete unaided with the big orchestra of modern times. See **PITCH**.

PIASTRE, *pe as' ter*. An old name for the Spanish dollar. The "pieces of eight" which the pirates of the "Spanish Main" are supposed to have buried, and with the discovery of which historical romancers ever since have busied themselves, were the eight-real pieces, or piastres. The term is no longer used in Spain.

In Turkey, in 1916, a reform of the currency was ordered, and a gold standard was instituted, with the piastre as the unit. According to the order issued at that time, the piastre is equal to forty paras. Piastre is also the name of a coin which circulates in Egypt and the Sudan.

PICA, *pi' ka*. See **EM**; **TYPE**.

PICADOR, *pih a dor'*. See **BULL-FIGHTING**.

PICARDY. An ancient province of France between Champagne on the east and the English Channel and Normandy on the west. It is in the main an area of low chalk uplands traversed by the River Somme. Over the chalk lies a clay soil of high fertility. Wheat and sugar beets are cultivated. Formerly much flax was grown. Picardy has long been famed for its wool. The largest town is Amiens (pop. 90,211 in 1931).

PICASSO, *pih as' so*, **PABLO** (born 1881). A Spanish painter, one of the most versatile and original artists in the modern manner. He came into prominence as the founder of the Cubist school (which see), but about 1920 he turned to other modes of expression, though without abandoning Cubism, as pictures like "The Circus" and "The Bull-fight" show. The effect of his early experiments appears in his subsequent attainment of a three-dimensional manner that achieves a high degree of realism; the portrait "Mother and Son" and "Blind Beggar" are well-known examples.

PICCARD, **PROFESSOR A.** See **BALLOONS**; **STRATOSPHERE**.

PICCOLO, *pih' o lo*. Small flute having a pitch an octave higher than that of the ordinary concert flute (see **FLUTE**). The music of the piccolo, however, is written an octave lower than the notes are sounded, for convenience of composition. The Piccolo is a strident instrument and must be used with care and knowledge in orchestral music, but it is of great value for certain types of climax and for many special effects. It is well and freely used by Rimsky-Korsakov. In some orchestras, the flute-player alternates in using flute and piccolo. Its compass is nearly three octaves.

PICKLES. Various fruits and vegetables preserved in vinegar and used to stimulate the appetite and to add flavour to the meal. Vegetable pickles are made chiefly from cauliflower, cucumbers, tomatoes, gherkins, onions, mushrooms and nasturtium seeds. Walnuts make an excellent fruit pickle.

Indian pickle, or piccalilli, is a popular relish consisting of a mixture of pickled cucumbers, onions, cauliflower, and spices, the vegetables being finely chopped. Chow-chow, similar to it, consists of tomatoes, onions, green peppers, cinnamon, allspice, cloves, peppercorn, mustard, salt and horseradish. Dill pickle is a cucumber pickle flavoured with the herb known as dill. Excellent sweet pickles or chutney are made from cherries, plums, peaches, pears, apples and grapes, and from many vegetables. Eggs, olives, etc., are preserved in a substance other than vinegar.

PICRIC, *pih' rik*, **ACID**. A yellow crystalline solid formed by the action of strong nitric acid on carbolic acid. Picric acid colours the skin and animal fibres yellow, but as it will not colour vegetable fibres, it can be used to test fabrics suspected of containing cotton. It is extensively used in the manufacture of explosives. See **EXPLOSIVES**.

Chemical Formula. The formula for picric acid is $C_6H_2(OH)(NO_2)_3$. A molecule contains six atoms of carbon, two of hydrogen, one hydroxyl group (OH), and three nitroxyl or nitro groups (NO_2). These groups are, respectively, associated atoms of oxygen and hydrogen and of nitrogen and oxygen, which remain unaltered in chemical reactions.

PICTON, **SIR THOMAS** (1758-1815). A famous British general; he was born in Pembrokeshire, and entered the army in 1771. He was gazetted major in 1795. From 1797 to 1802, he was Governor of Trinidad, and in 1808 became major-general. He served with distinction under Wellington in the Peninsular War from 1810 to 1814, and commanded the fifth division at Quatre Bras. He was killed in action against the French cavalry at the Battle of Waterloo.

PICTS. An ancient people of Scotland whose descendants are still to be found among the inhabitants of Southern Wales and Western Ireland. The first historical reference to them occurs in a speech made by a Roman orator in A.D. 297. For years the Picts carried on warfare with the Romans and the Teutonic invaders of Britain, the Angles and Saxons. About the eighth century, they disappeared as a separate race.

Derivation of Name. The name, from the Latin *picior*, "painter," was given the Picts by the Romans because of their custom of staining or tattooing their skins.

PIDGIN, *pij in*, **ENGLISH**. A kind of English, modified according to Chinese syntax,

used as a means of communication between foreigners and natives in China.

PIECE OF EIGHT. An obsolete Spanish silver coin, the peso duro, was valued at eight reals, and bore the numeral eight, thereby becoming known as a "piece of eight." It was equivalent to four English shillings, and was also commonly known as a Spanish dollar.

PIEDMONT, *peed' mont.* A fertile district in the northern part of Italy, now constituting a territorial department of that country. Switzerland adjoins it on the north, France lies to the west, and the Italian departments of Liguria and Lombardy bound it on the south and east; it constitutes the upper valley of the River Po. Its name, meaning "foot of the mountain" refers to its situation at the base of the high Alpine ranges that enclose it on all sides except the south. It is 11,331 square miles in area, and consists of the six provinces of Alessandria, Aosta, Cuneo, Novara, Torino (Turin) and Vercelli. Piedmont was formerly a part of the Sardinian kingdom. Population, about 3,528,000.

PIED PIPER OF HAMELIN. In Hamelin, Germany, in 1284, a strange piper, so legend says, charmed away the rats which were destroying the food supplies of the town. Robert Browning has immortalized the legend in a well-known poem.

After the great hordes of rats were drowned in the River Weser, the mayor and the councillors refused to pay the promised fee agreed upon with the Pied Piper. Again he blew three notes on his long pipe and the children of Hamelin followed him into the mountain fastnesses, never to return.

The inspiration for the legend is said to have been a German crusading youth, Nicholas, who led 20,000 German children up the Rhine Valley toward the Mediterranean, which, they had been told, would roll back as did the Red Sea for the Children of Israel, and thus provide a passage to the Holy Land.

PIE-POWDER, COURT OF. A tribunal in medieval England for the trial of disputes among pedlars and petty tradesmen. These courts were held at the great fairs; they were therefore called *pieds poudrés*, the Court of Dusty Feet.

PIER. A pillar or post supporting a heavy weight, such as the end of a span of a bridge, or the end of an arch. The term is at present generally applied to the heavy masonry supports of a bridge. It may also mean a construction extending from land out into the waters of a bay or harbour, for the purpose of forming a breakwater or a landing-place for boats. In architecture, the pier has developed into the column, with base, shaft and capital. See **BRIDGE**; **COLUMN**.

PIERCE, FRANKLIN (1804-1869). An American statesman, and fourteenth President of the United States, elected in 1853. He wished to preserve the Union, and to accomplish that purpose he thought it necessary to placate the South. He was a Northerner, with Southern leanings.

In dealing with foreign nations, and particularly with Britain, he was less willing to compromise, and was sometimes over-assertive of American rights.

At home an event of the first importance during his term of office was the establishment of the Republican Party. As President, Pierce lost popularity owing to his strong opposition to the abolition of slavery.

PIERROT, *pyair ro'.* Originally, a French clown; Molière, inspired by similar types in Italian comedies, first gave the name to a peasant in his *Don Juan, ou Le Festin de Pierre*. The English Pierrot was originally a more lively character than either the Italian or the French. Baudelaire declared that the English Pierrot of his day "enters like a tempest, falls like a bale, and then shakes the house when he laughs. This laughter resembles a joyful thunderstorm."

His mouth is increased by a simulated prolongation of the lips, carried out in two carmine strokes, so that when he laughs this mouth seems to open from ear to ear." In modern times the tendency has been to make the Pierrot more romantic and less clownish. He is always dressed in white, and appears with his face painted white.

PIERS PLOWMAN. See **LANGLAND, WILLIAM**.

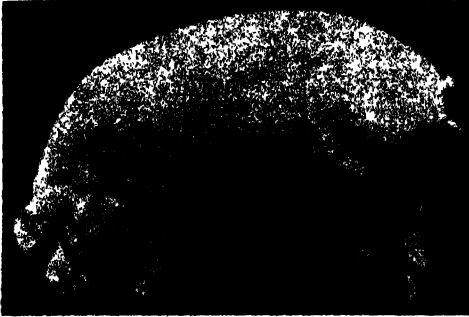
PIETERMARITZBURG, *pe ter mar' its burg.* The capital of Natal (which see).

FIG. The domestic pig is a member of the swine family, and because of its palatable flesh it has been esteemed as food in many parts of the world and for as long as history goes back. For long, however, a tradition of uncleanness has attached to it, so that its flesh is forbidden, among others, to Mohammedans and Jews.

The pig has a thick neck, which is in a direct line with the trunk and ends in a head tapering off into a short, pointed snout. Its feet have four horny, separately



FRANKLIN PIERCE
Photo U. & U.



CHESTER WHITE SOW
Photo: Cook & Gormley



TAMWORTH BOAR
Photo: Cook & Gormley

hoofed toes, two of which, in the domestic animal, have atrophied and no longer touch the ground. Often the pig is dirty white or a dull yellow in colour, but brown, black, and black-spotted pigs are common. Pigs will eat almost anything, though in the domesticated state their food is chiefly vegetable.

The term *boar* is applied to the adult male hog, and *sow* to the female.

Pigs are born in litters, that is, a number at a time, each litter usually consisting of from four to ten pigs, although as many as fourteen have been reported.

Pigs are unfairly charged with being dirty in their habits. It is true that they do wallow in mud, but all pachyderms, or thick-skinned animals, do this, because only mud or some

similar substance is cool enough to penetrate their tough skins. Actually, pigs thrive and breed better in clean quarters. The up-to-date farmer is as careful to keep the pigsty

clean as to insist on cleanliness in the stable, and to supply his pigs with fresh water and with food somewhat better than the refuse of the farm.

Apart from pork, various meat products are derived from pigs; of these bacon and hams are most popular. Besides the meat, the thick layer of fat under the skin is tried

out and refined for lard; the bristles are used in the manufacture of brushes; and the skin makes a very tough, durable leather. Other by-products include hair for mattresses, grease oil, sausage casings, glue and fertilizer.



PIG FARMING IN NEW ZEALAND
Photo: High Commissioner for New Zealand



BERKSHIRE SPOTTED AND POLAND CHINA SOWS

In Britain the commonest breeds are the Berkshire, Large and Middle Whites, Tamworth and Yorkshire.

In some countries of Europe, pigs are allowed to lead a semi-wild existence in woodlands, where they feed on acorns, beech-mast, roots, etc., and an excellent quality of flesh is produced in this way.

Scientific Names. Pigs belong to the family *Suidae*. The common European pig, from which domestic breeds are descended, is *Sus scrofa*.

PIGEON. There are several hundred species of this bird widely scattered throughout the world.

Pigeons vary greatly in appearance and habits, but in general they are medium-sized birds with dense, smooth feathers. In temperate regions this plumage is grey, brown, greyish-blue, or slate, frequently with a beautiful lustre. The *fruit-pigeons* are the most brightly coloured. The most characteristic feature of pigeons is the bill, which is small and weak and soft at the base.

Some pigeons live in trees and others build their nests on the ground; some live in colonies and others in isolated pairs. The pigeon does not raise its head, as do other birds, in swallowing; it is gluttonous in its eating habits, and has a very large crop, in which it is able to store food and carry it to its young. It builds its rough nest in exposed places, where it is in constant danger from enemies. The pairs mate for life. The eggs are usually white in colour, two in number, and are cared for during hatching by the male and the female in turn. Pigeons feed their young at first with a milky fluid, called *pigeon's milk*, secreted in the crop and fed through the bill into the gaping mouth of the nestlings. The food of pigeons consists of fruit, grain, seeds, etc.; unlike poultry, they need a certain amount of salt in their diet.

Both domestic and "fancy" breeds are probably descendants of the wild *rock pigeon* of Europe. Common pigeons differ little from the wild stock, but specially improved breeds are the *carrier pigeons* and the *homing pigeons*, the first used for messenger service and the second for the sport of pigeon-racing, for exhibition, and for food.

Only a few of the "fancy" varieties may be mentioned here. Favourites among exhibition birds are the *tumblers*, which when in flight turn somersaults in the air; the *fantail pigeon*, with large tail and head thrown back for balance; the *pouter pigeon*, with its large inflated crop; the *Jacobin*, with its neck feathers turning upward to form a cowl about its head.

Many of the smaller species are called *doves*. The most famous is the *turtle-dove*,

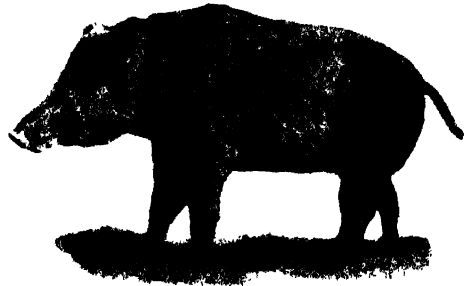
found in the eastern hemisphere and mentioned in the beautiful lines from the "Song of Solomon."

Classification. Pigeons belong to the order *Columbæ* and the family *Columbidae*. The rock pigeon is *Columba livia*. See CARRIER PIGEON; DOVE.

PIG IRON. See IRON AND STEEL.

PIGMENT. See COLOUR; PAINT.

PIG-STICKING. One of the chief sports of Europeans in India. Formerly, English officers rode down bears with their spears, but when the wild bear became extinct in



WILD BOAR
Photo: U. & U.

India, the wild boar took its place. The boar is a powerful, brave and cunning animal. Over short distances he can outpace a horse, and when cornered, will turn and charge in a furious attempt to dismount his attacker, using his sharp curved tusks, when he has the opportunity, with deadly effect. Spears for pig-sticking are of two kinds, long (or underhand) and short (or jobbing). In most of the military stations in India there are Tent Clubs to organize the hunts and the supply of native beaters.

PIKA, *pi'ka*. Any one of several species of rodents found on the heights of mountains in Asia, Europe, and Western North America. Pikas are near relatives of the hare and the rabbit, and resemble guinea pigs.

PIKE. The common name of a family of fresh-water fish, noted for their voracious appetites and fighting qualities.

The common pike is the most important species of the family, and one of the widest



PIKE
Photo: A. E. Hedge

in distribution, being found in fresh waters of Europe, North America, and Asia and also in large numbers in the great lakes

and rivers of Canada. It may attain a length of over 4 ft. and a weight of over 50 lb.; in colour it is bluish or greenish-grey, with irregular rows of whitish or yellowish spots. The pike is a terror to other fish in the waters it inhabits, greedily devouring about one-fifth of its own weight daily. It is a fine game fish, and its flesh is good eating.

Scientific Name. The common pike described above is *Esox lucius*.

PILASTER, *pil as' ter*. A square pillar projecting from a wall or pier from one-fourth to one-third its width, and finished with a base and capital like a column. The pilaster originated in Greek architecture. Pilasters are used for ornament and also for supporting an arch or a cornice. The finest are found in the Italian Renaissance



PILASTERS (a)

style of architecture. See COLUMN.

PILATE, PONTIUS. Roman Procurator of Judea from A.D. 26 to 36, whose period of administration covers the ministry of Saint John the Baptist and of Christ.

His name comes down to posterity as of ill omen on account of his responsibility for the crucifixion of Jesus, an act of whose injustice he was fully conscious, and which he made strong efforts to avoid, giving way to the fury of the Jews only when they made it clear to him that not to yield to them would endanger his own position with the suspicious Emperor.

He had already been censured by Tiberius for maladministration, and was anxious that no further ill-report of him should go to Rome. He chose therefore, after making the futile struggles mentioned in the Gospels, to send one whom he knew to be innocent to his death rather than to sacrifice his own political interests. The crafty leaders of the Jews, who had no power over life and death except through him, knew where to touch his weak spot when they said, "If thou let this man go, thou art not Caesar's friend."

Little is known of his later life. He was recalled to Rome by Tiberius in 36 on a charge made against him by the Samaritans, but before he arrived the Emperor was dead. Eusebius, the Church historian, states that he fell into great misfortunes in the reign of

Caligula, and committed suicide. The legend gathered later about his name, that his body was thrown into the Tiber, where evil spirits so disturbed the water that the body was removed to Vienne and sunk in the Rhône. It was again removed for the same reason and thrown into a lake in Switzerland, and finally plunged into a tarn on Mount Pilatus near Lucerne.

PILCHARD. Formerly of considerable commercial value, the pilchard, a herring-like fish of the same family as the herring, sprat and shads, has declined in popularity in recent years, and the very large



PILCHARD
Photo: Weller

pilchard fishery which once existed off the Cornish coast is of less importance than in earlier days. The pilchard is a shoal fish and is taken mainly in drift-nets. It may be distinguished from the herring by the fact that the dorsal or back fin is much closer to the head.

Scientific Name. *Clupea pilchardus*.

PILE. A long, thick pole sharpened at one end driven into soft ground to support buildings, or used in the construction of bridges, piers and wharves. Tree trunks of considerable length but of slight girth are most commonly used. The top of the log is protected by an iron band so as to keep the log from shattering under heavy blows, and the bottom is often shod with cast iron to enable it to penetrate compact soil. A battering ram, commonly known as a pile-driver and usually driven by steam power, is used for forcing the pile downward into position. Cofferdams are temporary enclosures in water which consist of piles driven close together and packed with clay or concrete. See COFFERDAM.

PILE DWELLINGS. See LAKE DWELLINGS.

PILES, also known as HAEMORRHOIDS, *hem' o roids*. Enlarged and varicose veins at or near the opening of the rectum. They are usually the result of constipation, particularly when that condition is accompanied by straining at stool, but may be caused by anything which gives rise to (1) pressure on the veins into which the affected veins open,

such as pregnancy, or (2) straining, such as occurs with enlargement of the prostate gland. There are two varieties, internal and external piles; the former are the more serious and troublesome, implicate a larger group of blood-vessels, and are lined with mucous membrane; the latter are lined with skin. Some mild cases give no discomfort, but inflamed piles are very painful, especially when they protrude from the rectum. Itching and bleeding may or may not be present. If the condition becomes greatly aggravated, a surgical operation may be necessary. Ordinary cases yield to local treatment. The use of medicated capsules, or suppositories, inserted into the rectum, will sometimes cure painful piles. The best modern treatment is the injection under the mucous membrane above each pile of a solution of carbolic acid in oil; this abolishes the affected veins and transforms them into harmless fibrous cords.

PILGRIMAGE. The visitation of shrines and tombs, or other places associated with persons whose memories are held in reverence, or with events of outstanding significance for the pilgrims. Most pilgrimages have a religious import, such as those to the Holy Places in Jerusalem, the tomb of Saint Thomas à Becket at Canterbury, the birthplace of Mahomet at Mecca, and the shrine of Our Lady at Lourdes. To undertake a pilgrimage involved fatigue and expense and often peril, and such proof of piety and devotion was rewarded by the Church. The pilgrims acquired merit and received grants of indulgences accordingly. Pilgrims usually bore some badge of their devotion; those returning from the Holy Land carried palm branches and were known as "palmerers." The Middle Ages were the great period of pilgrimages, yet in modern times the enthusiasm of disciples and admirers of great men still expresses itself in a similar way.

PILGRIMAGE OF GRACE, THE. Henry VIII's quarrel with the Papacy and suppression of monastic houses caused in 1536 a rising in the North, under the banner of the Five Wounds of Christ. The rebels forced Robert Aske, a lawyer, to be their captain; other leaders included Percies, Dacres, Bulmers and many great northern names. At Doncaster thirty thousand rebels were persuaded to disband by the Duke of Norfolk, who commanded the King's troops, but the realization that his promises would never be kept, started a second rising, for which Aske and many others were executed.

PILGRIM FATHERS. In the early days of Plymouth Colony, founded in 1620 in Massachusetts, Governor William Bradford often referred to his people as "pilgrims and strangers upon the earth." From this expression has come the use of the name "Pilgrim Fathers" for that band of liberty-seekers who made new homes for themselves on a new continent, over three centuries ago. The Pilgrim Fathers are not identical with the Puritans, though the two groups are often confused. The former were members of a sect that grew out of Puritanism, and in



MANOR HOUSE, SCROOBY, NOTTS
Home of Brewster, a leader of the Pilgrim Fathers
Photo: Taylor

England were called *Separatists*, because they separated from the Church of England. The first church of Separatists was at Gainsborough; a second and more powerful one grew up at Scrooby. Driven out of England by persecution, the Separatists established themselves first at Amsterdam, then at Leyden, and finally in America. They sailed from Plymouth in the *Mayflower* on 6th September, 1620, and after a stormy voyage of nine weeks landed near Cape Cod (Massachusetts), where they founded the settlement later called Plymouth Colony.

PILGRIMS' WAY. A name applied to the usual roads followed by medieval religious pilgrims, but more especially to the track running through southern England from Winchester to Canterbury. Along this road came thousands of pilgrims every year to do homage at the tomb of Thomas à Becket in Canterbury Cathedral—either for the winter gathering on the anniversary of his death, or for the summer on 7th July. The road, which is on the site of an early British trackway, ran from Winchester direct to Farnham, then followed closely the lower

slopes of the North Down ridge. Beneath the Hog's Back its site has been lost, but soon after crossing the Wey it reappears a few hundred yards below St. Martha's chapel, and has been preserved in part from that point as far as Titsey on the borders of Kent. Thereafter it is preserved in whole, and considerable stretches are still used as roadways or bridle tracks. It crosses the Darenth near Otford, and the Medway near Aylesford, thence proceeding south-east to Eastwell Park and north-east from there to Canterbury through Chilham. It has been established that this trackway was made by Neolithic men at least as early as 2000 B.C.

PILORY. An old instrument of punishment which consisted of wooden posts and a platform, with a framework so constructed that the head and hands of the culprit, and sometimes his feet also, could be thrust through holes, exposing him to public view and the scorn and ridicule of the people. The holes for the feet were called *stocks*. In times long past, the pillory was one of the chief sights of every English village, where it was used for all manner of offences of not too serious a character. Daniel Defoe, author of *Robinson Crusoe*, was pilloried for publishing a book without a licence; women were often placed in it; to increase the humiliation, sometimes the heads of both men and women victims were shaved.

The term is sometimes used figuratively, as in referring to a person who is held up to scorn and ridicule.

PILOT FISH. A species of fish found usually in tropical and the warmer temperate seas, but seen occasionally off the coasts of Great Britain and North America. It is long and silver-grey with dark blue bands. The fish has delicate flesh, which resembles mackerel in flavour.

The name of this fish is derived from its habit of accompanying ships and sharks. It swims close in front of the shark, probably for the purpose of feeding on fragments which the larger fish scatters, and to secure protection from its enemies. It is believed that the pilot fish is never attacked by the shark.

Scientific Name. The pilot fish is known as *Naucretes ductor*. It belongs to the family *Crangidae*.

PILSEN, *pil' zen*. See CZECHOSLOVAKIA.

PILSUDSKI, *pil soot' ske*, JOSEPH (Polish, JOSEF) (1867-1935). A Polish dictator, maker of modern Poland, who was revered as a popular hero.

Pilsudski was born in Lithuania, and educated at the Gymnasium of Vilna and the University of Kharkov, Russia. At the age of 20, he was exiled to Siberia for a five-year term, though the trial showed him to be innocent of implication in the anti-

tsarist plot of which he was accused. When he returned he joined the newly formed Polish Socialist party, organized to free Poland from the oppression of Russia.

The Workman, which he published from 1894 to 1904, voiced the most radical ideas. Pilsudski saw clearly that armed resistance would be the only means by which Russian rule could be cast off, and to accomplish this purpose, in face of lack of funds and munitions, he decided to seek outside aid. The Russo-Japanese War offered an opportunity, and he set out for Japan, but met with indifference. Failure did not discourage him, and by 1908 the first Rifle Exercise Corps, a "private Polish Army," was founded in Galicia, under the auspices of the Polish Socialist party.

At the beginning of the World War, Pilsudski thought the Central Powers would defeat Russia, and in turn France would conquer the Central Powers. In accordance with his convictions, he sided with the Central Powers, hoping that his private army, or legion, would be of sufficient support to his allies to secure their co-operation in the freedom of Poland. He broke with the Germanic Powers when they attempted to remove his troops from Polish soil and send them to the western front. As a result of trouble with the Austrian commanders, he resigned his command of the Polish legions in July, 1916. This act was responsible for the recognition of Polish independence by the Central Powers on 5th November, 1916.

In the provisional government then established, Pilsudski was made Minister of War. In July of the following year, he was arrested and imprisoned in the fortress of Magdeburg, because his men refused to take the oath of allegiance to Germany and Austria. German revolutionary authorities released him in November, 1918, and he returned to Warsaw to assume great but undefined powers as head of the Polish Republic. Wars with the Ukrainians, Czechoslovaks, and Bolsheviks followed in 1919 and 1920, in which Pilsudski and his men were victorious, thereby averting a possible new war involving all Europe. Poland had to agree to dividing Upper Silesia with Germany, but was granted the "Polish Corridor," a strip of West Prussia giving an



MARSHAL PILSUDSKI

Photo: U. & U.

outlet to the Baltic Sea. He resigned the Presidency in 1922, expecting to retire to private life.

In 1926, as a result of corrupt government and financial difficulties in Poland, Pilsudski engineered a *coup d'état*, saw to the election of his friend Moscicki as President, and dictated new Cabinet appointments, securing for himself the position of commander-in-chief of the armies of Poland. In September, 1926, opposition to his *régime* resulted in his taking over the Premiership. His aggression against Lithuania, which he believed should belong to Poland, gave Europe cause for uneasiness in the autumn of 1927, but the good offices of the League of Nations brought a measure of peace to the two countries.

Pilsudski's foreign policy was alliance with France and Rumania, from the fear of Russia; with Germany he maintained a relation of qualified friendship. At home he suppressed corruption and set up a strong government. Although he was not officially in control, his military reputation, his patriotism and his popularity made him as absolute a dictator as any in Europe, and his strong rule made Poland a nation. See **POLAND**.

PIMENTO, *pim en' tō*. The popular name of a small evergreen tree of the myrtle family, from which is obtained a spice known as *allspice*, *Jamaica pepper*, or *pimento*. The name is derived from *pimienta*, the Spanish word for peppercorn, to which the spice bears a resemblance. The tree is native to the West Indies; most of the commercial spice is obtained in Jamaica. The pimento grows to a height of from 20 to 40 ft. The slender, upright trunk has many branches at the top and is clothed in a smooth, grey bark. The shining green leaves are lance-shaped; they contain an essential oil, and are aromatic when fresh. The fruit is a small berry, black, glossy, sweet, and juicy when ripe, and about the size of a black currant. It is the unripe berry that is used for the spice of commerce, for the fruit loses much of its aromatic property by maturing.

Scientific Name. The pimento belongs to the family *Myrtaceae*, and is known botanically as *Pimenta officinalis*.

PIMPINEL. A well-known plant of the *Anagallis* family. The scarlet pimpernel bears bright scarlet flowers, which expand only in fine weather, earning for the plant the name of *poor man's weather-glass*. The leaves are egg-shaped. It grows abundantly, flowering from June to September. There is also a variety that bears a bright blue flower. The bog pimpernel, so called because it grows in boggy ground and on the banks of rivulets, has a slender stem. The leaves grow in pairs, and the rose-coloured flowers are larger than those of

the scarlet pimpernel. The yellow pimpernel bears solitary axillary flowers, yellow in colour. There are many other varieties, all easily capable of being cultivated.

Scientific Names. The pimpernel is of the *Anagallis* family. The scarlet pimpernel is *A. arvensis*; the bog pimpernel, *A. tenella*; and the yellow pimpernel, *Lysimachia nemorum*.

PIMPLE. See **ABSCESS**; **ACNE**.

PIN. According to tradition, there was a time when the people of England were taxed to provide the queen with money to buy pins; the same tradition tells us that it was from this custom that the term *pin money* was derived. Be that as it may, we know that in earlier days, thorns, pointed sticks, bones, and other articles were used for pins. In Egyptian tombs, pins of bronze, highly ornamented, have been found, some of them 6 or 8 in. in length. The immediate forerunner of the pin in common use to-day was a pin made of brass wire. It had a head consisting of a coil of fine wire wound around one end of the shank and soldered to it.

Timothy Harris, an Englishman, made a solid-headed pin in 1797 by moulding the heads; in 1824 Lemuel Wright, an American, obtained a patent for a machine to make pins out of a single piece of wire, but he took out his patent in England, where solid-headed pins were first made. Wright's machine has been greatly improved, but its invention was the first step in the modern method of pin manufacture.

Pin-Making. The pins used to-day are turned out with incredible rapidity by an ingenious machine into which iron, brass, or steel wire is fed from a reel. The wire is straightened, cut into proper lengths, and seized by lateral jaws beyond which just enough of the wire protrudes to form a head. A blow from a die flattens and shapes this end into the head. The pins are then carried forward until the lower end is brought into contact with revolving files, which grind the point. The pins are thus shaped, and only the finishing remains to be done. This is accomplished by boiling them for several hours in a preparation of tin. They are then washed and given a higher polish by being rolled in a cylinder filled with bran or fine sawdust.

The machine which sticks the pins into the papers in which they are sold is hardly less ingenious than that which makes them. It crimps the paper and thrusts the pins in place at the same time.

PINDAR (about 522-443 B.C.). A lyric poet of ancient Greece. He belonged to a noble family and lived at Thebes, in Boeotia. His poetry is more representative of Greece as a whole than that of any other Greek

writer, largely because he travelled more widely. His contemporary reputation may be judged from the fact that when Alexander the Great razed Thebes to the ground, and all the other houses were destroyed, that of Pindar was left standing.

His style was magnificent, and no translation into a modern language can give an adequate idea of the music of his lines. He was the first Greek writer to proclaim the immortality of the soul and to portray a judgment after death. Many of his lyrics were composed to be sung by a trained chorus of youths and maidens. There are extant, practically entire, four books of triumphal odes composed in honour of the victories at the Olympian, Pythian, and other great Greek games; also, various fragments of hymns to the gods, processional odes, dancing songs, dirges, and eulogies. See GREEK LITERATURE; ODE.

PINDAR, PETER (Wolcot, John). (1738-1819). Satirist. After being in turn a doctor and a clergyman, Peter Pindar (to give him the pen-name by which he is best known) became in middle age a voluminous writer of verse satire. In 1786 he published *The Lousiad, a Heroi-Comic Poem*, and in a long succession of lively satires he ridiculed many of the prominent people of the day.

PINDUS MOUNTAINS. See GREECE.

PINE. The name of a family of cone-bearing evergreen trees, distinguished as



AUSTRIAN PINE
Photo: E. J. Hosking

the oldest living trees that have descended from the forests of geological time. Within this great family, which includes larches,



AN ENGLISH PINE WOOD

spruces, hemlocks, firs, and others (see CONE-BEARING TREES), is the genus *Pinus*, made up of eighty different species. They are

found from the Arctic Circle to the high altitudes of the tropics.

The pines may be distinguished from the rest of the cone-bearing trees by the arrangement of their needles; these are borne singly or in groups of two to five, and have paperlike sheaths around their bases. The pines called "soft," because of their soft wood, shed these sheaths when the needles reach full growth, but the resinous "pitch" pines keep them until the needles drop. While the trunks are straight and tall, sometimes reaching 250 ft., the shapes of the trees vary from round to pyramidal; the lengths of the cones range from 1 to 18 in. or more. A sandy soil is the most suitable.

Principal Species. Foremost among all the pines is the *white pine*, native to the American continent. Unsurpassed by other pines in beauty, rapidity of growth, and value and durability of

have been largely cut down, though re-afforestation is proceeding.

The wood of this pine is soft but compact, straight-grained and easily worked, and takes a fine polish. It can be readily painted or varnished, and so is admirable for interior finishing.

Masts and the spars of vessels and furniture and roof tiles are also made from it. The bark yields a sap that is used in cough mixtures. In England and on the Continent, the white pine is extensively planted under the name of *Weymouth pine*, from



WEYMOUTH WHITE PINE

Photo: E. J. Hoshing

when the needles reach full growth, but the resinous "pitch" pines keep them until the needles drop. While the trunks are straight



CHILE PINE
(Monkey Puzzle)

Photo: E. J. Hoshing

timber, the white pine has suffered greatly from the lumberman's axe, and the magnificent virgin forests of Canada and U.S.A.



SPRAY SHOWING LEAF AND CONE OF
SCOTS PINE

Photo: E. J. Hoshing

the person who introduced it into Great Britain.

The only species native to Britain is the *Scots pine*, one of the most important commercially in cooler parts of Europe.

The great *sugar pine* reaches a height of 220 ft., with a diameter of about 10 ft. Other important species include the *Corsican pine*, a straight-grained tree which may attain a height of over 150 ft; the wood is useful for many purposes. The tree is native to countries along the Mediterranean, and outgrows the Scots pine in England.

Pine Industries. Wood is not the only product of the trees. A forest of 10,000 long-leaved pines should yield annually for four years about 400 barrels of liquid resin,

from which tar, pitch, turpentine, and resin are extracted. In times past the waste involved in resin gathering was serious,

but this has been reduced with improved methods, putting to use constituents which formerly escaped in smoke. A recently perfected process has made it possible to extract alcohol of the highest grade from sawdust.

Another use of the pine is derived from its liking for a sandy soil. Many pines, but chiefly the

maritime pine (*P. pinaster*), are planted on shifting dunes to bind the soil together.

Scientific Names. The pine family is *Pinaceae*. The white pine is *Pinus strobus*; the sugar, *P. lambertiana*; the Norway, *P. resinosa*. The Scots pine is *P. sylvestris*; the Corsican pine, *P. Laricio*.

PINEAL GLAND. See ENDOCRINE GLANDS.

PINEAPPLE. A fruit native to tropical America. It received its name from its

resemblance to a pine cone. It is usually about 8 in. long, and very large varieties may weigh from 16 to 20 lb. Under its thorny, reddish skin there is a firm, pale-yellow meat. Protected by its hard covering, it will stand more rough handling and keep longer than any other tropical fruit, and it can be obtained throughout the year. Its distinctive flavour makes the pineapple a favourite dessert and salad fruit.

The pineapple plant bears a single thick stalk with stout, toothed leaves. The ripe head results from a thickened rachis (spine, or vertebral column) and embedded, fleshy bracts and berry, the flowers being largely abortive. Externally, the solid fruit is covered with the tips of the thick, hard floral bracts and crowned with a tuft of smaller leaves. Only one fruit is borne by any one stalk, but the same root may produce more than one fruiting stem.

The pineapple was introduced into Europe by the Spaniards after the explorations in South America; the earliest mention of its use in England was made by John Evelyn in his *Diary*. For many years it was cultivated in private gardens in England and on the Continent, but owing to the great development of pineapple culture in the tropics, the hothouse plant is now rare. European markets are largely supplied by the plantations of Northern Africa, the Canaries, the Azores, and the West Indies. Considerable pineapple shipments are also received from the Bahamas, Jamaica, and Trinidad.

Pineapples do not ordinarily produce seed. For commercial production they may be



SCOTS PINE

Photo: E. J. Hosking



FIELD OF PINEAPPLES

propagated by plantings of *crowns* (the tufts of leaves at the top of the fruits); by use of *suckers* (from near the base of the stalks); from *slips* (at the base of the fruits); and from *valoons* (bud roots). Suckers are most commonly used. Plantations bear from eight to ten years before they require resetting, as the old plants are replaced by suckers. The fruits are harvested by hand. A delicate fabric, the pina muslin of the Philippines, is woven from the fibre of the larger leaves.

Scientific Name. The pineapple belongs to the family *Bromeliaceae*. Its botanical name is *Ananas sativus*.

PINERO, *pin nē ro*, SIR ARTHUR WING (1855-1934). An English dramatist, born in London, the son of a Jewish solicitor. He was destined for the legal profession, but soon became interested in the theatre and appeared as an actor in Edinburgh in 1874. Later, he was a member of the Lyceum Company of London, under Henry Irving. He was knighted in 1909. He was a master of plot construction, and nearly all his plays succeeded. The best are: *The Second Mrs. Tanqueray*, *Trelawny of the Wells*, *The Notorious Mrs. Ebbsmith*, *The Gay Lord Quex*, *The Squire*, *His House in Order*, *Mid Channel*, *The Mind-the-Paint Girl*, and *Sweet Lavender*.

PING-PONG. The older name for table tennis (which see).

PINK. A genus of flowering plants known technically as *Dianthus*. While the blossoms



PINEAPPLES GROWING IN AUSTRALIA

Photo: Australian Trade Publicity

are often seen in shades of pink, the name *pink*, according to many authorities, is used in the sense of "pierce," or "puncture," and refers to the crinkled edges of the petals. The genus includes several favourite garden flowers. The cultivated varieties include the *carnation* (which see); derivatives of the *common*, or *feather*, *pink*; *clove pinks*; scentless *China pinks*, small-flowered *maiden pinks* and the *Cheddar pink*, a British native, and *sweet williams* (which see), or *bunch pinks*. The species are propagated from seeds and cuttings. Their greatest charm is the characteristic scent, which even the smallest varieties possess.

Scientific Names. The genus belongs to the family *Caryophyllaceae*. *Dianthus caryophyllus* is the parent species of the cultivated carnation and clove pinks, the common pink is *D. plumarius*; the China, *D. chinensis*; the maiden, *D. deltoides*; the Cheddar, *D. caesius*; the sweet william, *D. barbatus*.

PINTAIL. A bird of the duck family, *Anatidae*. Pintails are easily recognizable by the long point to the tail made by the elongation of the central pair of tail feathers. Most of the plumage of the back is marked with fine black and white wavy bands. The British species now breeds only in parts of Scotland.

Scientific Name. *Defile acuta*.

PIPE, TOBACCO. A small bowl, fitted with a hollow, reed-like stem, for the smoking of



DWARF PINK

A type suitable for rock gardens.

Photo: Carters

tobacco. Pipes of a very simple kind were probably used in England for the smoking of medicinal herbs before tobacco was introduced from America, but it was the popularity of tobacco that made pipe-making both an art and an industry. The American Indians, who had smoked tobacco from the earliest times, carved their pipe bowls out of stone or shaped them of clay. The pipe of the Indian had a ceremonial use, and the smoking of the peace pipe was a most important event.

When the Europeans acquired the habit of smoking, they used first either a pipe of silver, or a walnut shell with a straw thrust into it, but better devices were soon discovered. As both clay and briar root take up much of the unhealthy nicotine before it reaches the mouth, pipes came to be made of these substances. Meerschaum, a soft porous mineral, was first used in Germany. The mouthpieces were formerly of amber, silver, or ivory; hard rubber, bakelite, and similar materials are now commonly used. In Holland, porcelain pipes with huge bowls, often painted in brilliant colours, are still favoured.

In an Oriental variety—the hookah—the bowl is fitted into an airtight vase partly filled with water, and a tube passes downward into the water. A flexible tube with a mouthpiece is fitted into the side of the vase, and the smoke passes through the water before it enters the mouth.

PIPE-CLAY. See CLAY.

PIPE-FISH. The name of a group of fishes which have a characteristic tube-like snout, ending in a small, narrow, toothless mouth, opening upward. A remarkable feature of the family is a pouch in the male, in which the eggs are placed by the female;



PIPE-FISH

there they are kept until hatched. The young also remain there until able to care for themselves. The body of the pipe-fish is long, slim, and snake-like, is covered with bony plates, and varies from 12 in. to 3 ft. in length. Pipe-fish are found in the warmer

seas and are related to the hippocampus, or sea-horse. Several species are found in British waters, including the so-called sea-adder, with an average length of 2 ft.

Scientific Name. The common pipe-fish of the British coast is *Syngnathus acus*.

PIPE-LINE. A conduit of metal pipes laid overland to carry (usually) oil from the fields to a refinery, market, or place of shipment. The use of joints containing a flexible ring allows of the pipes being laid over rough country without the need of special units. Pipe-lines have long been in use in the U.S.A., Russia, etc. One of the largest in the world is that of the Iraq Petroleum Company opened in 1935, which brings oil from the Mosul oilfields of Iraq to the Mediterranean at Tripolis (Syria) and Haifa (Palestine). The total length is 1150 miles.

PIPIT, pip' it, or TITLARK. A small song bird, about 7 in. in length and of quiet, brownish-grey plumage. The move-



PIPIT

(American species.)

Photo: Visual Education Service

ment of its tail shows its relationship to the wagtail; yet, like the lark, it sings while on the wing (see LARK; WAGTAIL). The most common British species is the titlark or meadow-pipit, but the tree-pipit and the rock-pipit are also to be found. The nest of the titlark, built of grasses, is placed on the ground, and the eggs, four to six in number, are greyish-white or bluish-white in colour, thickly speckled with dark brown. The pipit helps the farmer by devouring insects; it also feeds on small shells and seeds. There are many species scattered round the world, of which North America has two.

Scientific Names. The pipit belongs to the family *Molatriidae*. The titlark is *Anthus pratensis*; the tree-pipit is *A. trivialis*, and the rock pipit *A. spinoides*.

PIQUET, or PICQUET, pe ket' or pik' et. A game of cards played by two persons, with a pack from which the twos, threes, fours, fives and sixes have been removed. The players draw for first deal, high card winning the deal. The dealer deals twelve to each player, two or three at a time; the

remaining eight cards constitute the stock, from which discarded cards are replaced. The non-dealer is required to discard one card, and (if he choose) may discard five; the dealer has the privilege of discarding three. Sometimes six hands may be considered a game, and the score is determined by the difference between the two hands, plus one hundred for game. A player scoring less than 100 has his score added to his opponents in the reckoning. A player must follow suit if possible, and the winner of one trick leads for the next. There are no trumps.

Before discarding, if either player discovers he has no honour cards in his hand, he can claim *carte blanche* and score 10. Further scoring is made after the discard. The non-dealer states in succession, the dealer replying each time with similar information: (a) Number of cards in longest suit, longest sequence of cards, whether he holds four or three Aces, Kings, Queens, Knaves or tens. Ace counts eleven, other honours ten each, remaining cards according to pips. A tie on the first declaration is decided by a counting of card values, on the second by the highest card of the sequence. In final ties neither player scores. Play now begins.

In playing, the leader of each trick counts 1 for his card, the winner of the trick also counts 1, and the winner of the last trick counts 2; the player who succeeds in winning more than six tricks counts 10 for cards. If a player wins all the tricks, he wins a *capot*, which gives him 30 additional. Other scoring is as follows: (a) Cards of a suit, 1 for each card. (b) Sequence: 1 for each card up to four; five, six, seven and eight count 15, 16, 17 or 18. (c) Four of a kind counts 14, three of a kind 3 only. Only the holder of the highest kind (four tens beating three aces) scores. *Repique*, counting 60, is gained by one who scores 30 before his opponent scores at all and before play from hand begins. *Pique*, counting 30 only, is scored under like conditions, but after play from hand has begun.

PIRACY. The taking control of a ship on the high seas from those in whom legal control has been invested, and sailing away with the ship itself, or with any of its contents, under circumstances that would have amounted to robbery if performed on land. Pirates can be pursued or captured without a declaration of war, but they cannot be killed except in battle. If captured, they must be brought before a competent court. Vessels in the earliest days were constantly menaced in the Mediterranean, even when it was the world's chief highway for shipping. Efforts to stamp out the pirates never

brought lasting results and later the Moham-medan pirates, working from the Barbary coast, became so powerful that they effectively closed the western Mediterranean to Christian shipping. While there was both at that and other periods, considerable "free-lance" piracy, much was overtly encouraged. Cities like Genoa and Pisa, for instance, owed much of their prosperity in the Middle Ages to the seizure, under conditions of piracy, of the shipping of rival states. Pirating, too, off the Spanish Main was frequently encouraged by those who shared in the spoils in England. The rise of national navies to protect shipping led to the virtual stamping out of piracy, and in modern times what piracy has survived is practically confined to the China seas.

PIRAEUS, *pi' re' us*. See GREECE.

PIRANDELLO, LUIGI. (born 1867). Italian playwright, novelist and poet; was born in Sicily and was educated at Rome and Bonn. He is a prolific writer, and has won an international reputation in particular for his plays, which are highly original in theme and treatment. Among the best known of the translated plays are *Six Characters in Search of an Author*, *Henry the Fourth*, and *The Mock Emperor*. In 1934 Pirandello was awarded the Nobel Prize for Literature.

PIRATE. See PIRACY.

PISA, *pe' za*. See ITALY.

PISA, COUNCIL OF. The name of a council called at Pisa, Italy, in 1409, to terminate the Great Schism of the West, which had troubled the Church for thirty years. At that time the Church was divided in its allegiance to two Popes, Gregory XII and Benedict XIII. The Council was called on the understanding that the rival popes should abdicate, so that a new pope might be chosen with undisputed title. They did not resign, however, and both were deposed. The right of the Cardinals to depose was more than doubtful. Alexander V was elected, but Gregory and Benedict refused to waive their rights, and the Schism continued eight years longer, and was then ended by another council which met at Constance and elected Martin V to the Papal throne.

PISA, LEANING TOWER OF. A marble bell tower in the Italian city of Pisa. Begun in 1174 and completed in 1350, the structure commenced to dip after the first three galleries had been constructed. The slant of the tower is now about 14 ft. from the perpendicular.

Constructed entirely of white marble, the tower rises to a height of 179 ft., having the bells in its uppermost eighth story. The walls are 13 ft. thick at the base, and between 6 and 7 ft. thick at the top.

Galileo, a native of Pisa, made use of the Leaning Tower in his experiments to determine the velocity of falling bodies.



PISA: THE LEANING TOWER AND CATHEDRAL

PISCES, *pis' eez*, THE FISHES. One of the constellations of the zodiac; it has no conspicuous star. It contains the first of Aries, or the vernal equinox. The constellation Pisces now occupies the sign of Aries, the first sign of the zodiac. The sign Pisces is the twelfth of the zodiac, and into it the sun enters about 19th February. The symbol of Pisces is ♓. According to Greek mythology, the Fishes are Aphrodite and her son Eros (Cupid), who were turned into fish when fleeing from the monster Typhon.

PISGAH, *pis' gah*. A mountain range, east of the Jordan, from which Moses viewed the Promised Land (Deuteronomy xxxiv. 1).

PISISTRATUS, *pis is' tra tus*. A tyrant of Athens of the sixth century B.C. The date of his birth is unknown; his childhood was spent under the influence of Solon, who was related to his father, Hippocrates. From an early age he showed ambition, and used his wealth to ingratiate himself with the party of the Hills (one of the three political divisions into which Athens was separated). Later he married into the family of Megacles of the Alcmaeonidae, so winning the alliance of the party of the Shore. After more than one unsuccessful attempt, he finally seized power in 540, and from that time ruled over Athens with the consent of all three parties until his death in 527.

On the whole his rule seems to have been beneficent. Encouragement was given to the arts; sculpture and poetry both flourished; trade grew with the recovery of Sigeum; he built temples to Athene and Dionysus, began a huge temple of Zeus, and also improved the water-supply of the city with an aqueduct from the Ilisus. The Solonian constitution was retained and administered with due regard to equity.

PISOLITE. See OÖLITE.

PISSARRO, CAMILLE (1831-1903). French Impressionist painter. Influenced by Corot and then by Monet, he devoted himself to interpreting sunlight effects in town and country. "Rouen Cathedral," "Red Roofs," and "L'Effet de la Neige" are well-known works.

PISTACHIO, *pis tah' shio*, or *pis tay' shio*. A small tree native to Syria, cultivated chiefly in countries bordering on the Mediterranean Sea. Pistachio nuts, the stones of the olive-like fruit of the tree, are valuable for their bright-green, oily kernels. Oil pressed from them is used in cooking. Sicily is now the source of the best nuts. The bearing plants there are the result of grafting the pistachio on the wild turpentine tree, which belongs to the same genus.

Classification. The pistachio tree belongs to the cashew or sumac family, *Anacardiaceae*. Its botanical name is *Pistacia vera*.

PISTIL. See FLOWER.

PISTOL. A short-barrelled firearm, designed for use with one hand. The word is derived from the French *pistolet*, originally meaning "a dagger," or similar close-quarters weapon. The close connection between *pistol* and *dagger* is preserved in English by the use of the word *dag* for a short musket or long pistol.

Early pistols were simply iron tubes, fixed to a wooden stock by metal rings. At the rear end of the barrel was a pan containing priming powder, with a hole communicating with the powder charge. The powder in the pan was fired by the rotation of a wheel which emitted sparks, and the flash passing down the hole fired the charge. This method was replaced by a flint gripped in the hammer, and later by a percussion cap. These pistols were very heavy, had one or two barrels, and were sometimes as much as 2 ft. long. In some cases, a pistol barrel was fixed in the guard of a sword, but they were usually carried in holsters fitted on the saddle-bow.

In the eighteenth century, the pistol almost ousted the sword as a duelling weapon. Duelling pistols were beautifully chased and finished—often arabesqued with gold or inlaid with ivory—and were very accurate up to thirty paces.

A modern Army pistol has a range of

1200 yards, and is a very powerful weapon. Modern pistols are made either in the form of a *revolver* or of an *automatic pistol*. In the first, a metal cylinder containing a number of cartridges is revolved by the pressure of the finger upon a trigger. In an automatic pistol, fresh cartridges are pressed up into the breech from a magazine by the force of the recoil, which also ejects the empty case and re-cocks the pistol. Both have a single barrel and are capable of a high rate of fire.

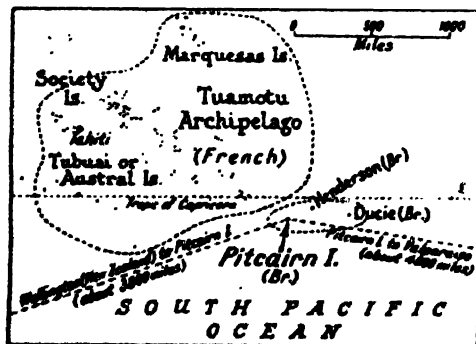
The bore, or diameter of the inside of the barrel of a pistol, varies from .22 in. to .45 in.; a pistol can be so small that it will go in a waistcoat pocket and yet can kill a man. Up to the South African War, a pistol was the secondary weapon of cavalry; it has now been replaced by a rifle or carbine, but all officers, and infantry working machine guns or light automatics, are armed with a pistol or revolver in place of a rifle.

In strong contrast to the old "horse pistols" in which the butt or grip was almost in continuation of the line of the barrel, the modern handle is at right-angles to the barrel. This reduces the shock of discharge, but throws the pistol off the mark at each shot.

PISTOLE. The name of gold coins, usually the same size as the English sovereign, that were in circulation in several European countries in the sixteenth century, and later. In Spain, the pistole, introduced in 1537, was the chief coin of the currency. The name was also applied to the French *louis d'or* issued by Louis XIII in 1640, and to the gold coins of other countries, including those of Switzerland, Italy and Germany.

PISTON. See PETROL ENGINE.

PITCAIRN ISLAND. A small, lonely island situated in the Pacific Ocean, far east of Australia and about 2° south of the Tropic



of Capricorn. It belongs to Great Britain. Carteret discovered it in 1767, and it was first colonized by nine of the crew from the *Bounty* mutiny, who, together with

six men and twelve women, natives of Tahiti, landed there in 1789. The colony was not discovered until an American vessel visited the island in 1808, having come upon it by accident. Seven years later it was visited by an English vessel, whose captain was impressed by the peace and tranquillity of the settlement.

Formal possession by Great Britain was taken in 1859. In 1856 the islanders were all taken to Norfolk Island by British authorities, since the population was becoming greater than the island could maintain; later some returned.

The area of the island is about 2 sq. miles, and the last census, taken in 1931, showed 200 persons. Various tropical crops and fruits grow luxuriantly.

"Bounty" Mutiny. In 1789 part of the crew of the *Bounty*, a British ship carrying young breadfruit trees from Tahiti to the West Indies, mutinied and put nineteen men, including Captain Bligh, to sea in an open boat. They drifted for three months over a distance of 3600 nautical miles, and finally landed at the island of Timor. The mutineers at first returned to Tahiti, but some, fearing capture, escaped to Pitcairn Island. The last of the mutineers, John Adams, died in 1829.

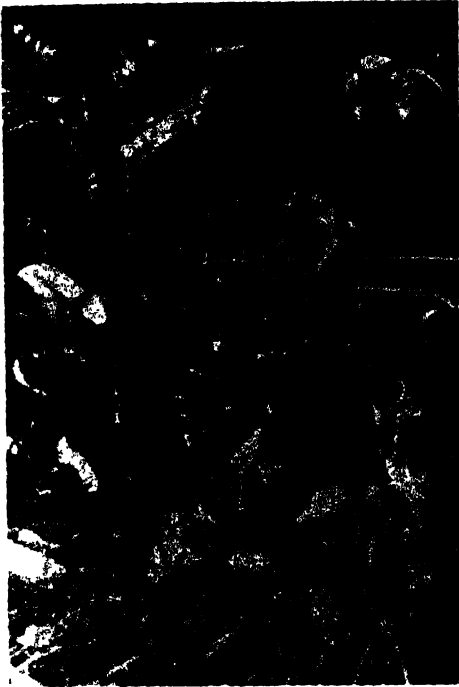
PITCH. A dark-hued compound of carbon and hydrogen, obtained as a residue in the distillation of coal tar, of which it forms about two-thirds. Pitch is found naturally in asphalt beds. The resin obtained from certain evergreen trees after the distillation of turpentine is also called pitch. Wood pitch is a by-product of the distillation of pine wood. See ASPHALT; COAL TAR; TAR. TURPENTINE.

PITCH. In music, the acuteness or the gravity of sound. Musical notes are composed of regular vibrations of a sounding body. The number of these vibrations per second determines the pitch of the note in question. "Middle C" on a piano (the right-hand of those two consecutive white keys which are opposite the left-hand end of the lock which fastens the keyboard lid) is the note one octave below that note which is produced by a sounding body giving 522 double vibrations to the second (on the "New Philharmonic" standard of pitch, that now in most general use).

PITCHBLEND. Name given a brown to black or greenish massive mineral which is commercially important as a source of radium. The name refers to its pitch-like lustre. Its composition varies, but it always contains uranium in combination with oxygen, associated with oxides of other metals. Radium was first extracted from pitchblende obtained in Bohemia (now Czechoslovakia). The richest deposits are

found in the Belgian Congo and in the Great Bear Lake region, Canada. Polonium and actinium are other radioactive elements which have been extracted from pitchblende. See RADIUM; URANIUM.

PITCHER PLANTS. A family of plants having pitcher-shaped leaves that form traps for insects, which are digested and absorbed as food. This method of obtaining nourishment places the pitcher plants in the



PITCHER PLANTS

Photo Visual Education Service

group known as *carnivorous plants* (which see). In an American variety, the *side-saddle flower*, the pitcher shape results from a peculiar folding together of the leaf margins, permitting rain-water to collect in the receptacles. At the mouth of each pitcher is a thick growth of bristly hairs, all pointed downward and inward, and when insects, attracted by a sweet secretion within the rim, fly into the trap, they are unable to turn back because of the hairs, and so are drowned.

Scientific Name. The pitcher plants form the family *Sarracenaceae*.

PITCHSTONE. A name given to a glassy, volcanic rock which occurs as dykes or lava flows. It is usually dark in colour (green, blue, brown or black) with a greasy lustre. The rock breaks with a glassy conchoidal or splintery fracture.

PITH, or MEDULLA. The centre cylinder of certain types of trees. Cells of pith are divided into three categories: (1) for storing starch; (2) for crystal formation; (3) inactive. As the tree develops, the pith becomes dry. Pith, being extremely light, is used for the manufacture of helmets for wear in the tropics.

PITMAN, SIR ISAAC (1813-1897). An English educationist, world-famous for his invention of the system of shorthand writing which is known by his name. He was born at Trowbridge, in Wiltshire, and taught for some years as a schoolmaster.

After 1843, he devoted himself entirely to developing his system of phonography, or shorthand, which was first given to the public in 1837 in his *Stenographic Sound-Hand*. This shorthand method was so much superior to all that had preceded it that it immediately took first place in public favour. From 1842 until his death, Pitman published the weekly *Phonetic Journal*, and he took a keen interest in spelling reform, publishing several pamphlets on that subject. Later, competing for a prize offered by the Government for the best method of collecting prepaid postage on letters, Pitman suggested stamps. He further suggested that the stamps should be used for sealing the letters, and this lost him the award as a competitor recommended placing them on the face in the upper right-hand corner. His system of shorthand has been revised several times, and to-day is still the leading system.

In 1894 he was knighted for his work.

PITT, WILLIAM, 1ST EARL OF CHATHAM (1708-1778). One of the greatest of British statesmen. He was known before his elevation to the peerage as the **GREAT COMMONER**. He was born at Westminster, and was educated at Eton and at Trinity College, Oxford, but owing to ill health, did not take a degree. In 1731 he entered the army, but four years later relinquished a military career to become Member of Parliament for Old Sarum, the family borough. Almost immediately he became a noteworthy figure in the House of Commons, and Robert Walpole found in him one of his sharpest critics.

His determined opposition to Walpole brought him a reward when he least expected



SIR ISAAC PITMAN

Photo Brown Bros.

it; the Duchess of Marlborough, dying in 1744, left him a legacy of £10,000.

A Trusted War Minister. In 1746 Pitt received his first office, Vice-Treasurer of Ireland, and later in the same year was made Paymaster-General, with a seat on



WILLIAM PITT
First Earl of Chatham.

the Privy Council. By his refusal to accept in this position the special emoluments which previous holders of the office had taken without question, Pitt won for himself the complete confidence of the people, and so advanced his career. Dismissed from office in 1755 because of his outspoken criticism

of the Ministry's war policy, Pitt was made Secretary of State and leader of the House of Commons in 1756. Here again he failed to hold the regard of George II, and was forced to resign within a year, but the nation spoke its feelings so strongly that the king was compelled to recall him at once.

As virtual head of the government, of which the Duke of Newcastle was the nominal head, Pitt turned his attention to making England a great power among the nations and much of the praise for campaigns which overthrew France and won for England glory in America and in India belongs to him. See **GEORGE II.**

Fall and Return to Power. When George III became king in 1760, Pitt's fortune began to change, for the new king had no love for the great Minister. Failing to convince the Cabinet of the necessity of action against Spain, Pitt resigned in 1761, and remained for five years out of office, though he still exerted a powerful influence in public affairs. Especially did he oppose the imposition of taxes on the American colonies. In 1766 he was called upon to form a new Cabinet, and was at the same time created Earl of Chatham. Hitherto often designated the Great Commoner, his acceptance of the peerage lessened his popularity, and his health was so poor that he was able to take only a subordinate part in the work of the Ministry, which made the most disastrous mistakes in its handling of the American question.

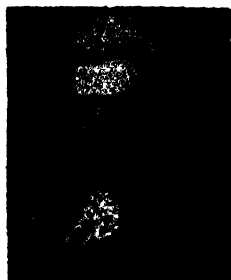
In 1768 he resigned and never afterwards held office, though he still took a keen interest in public affairs, and did not cease to attack in the House of Lords the government's policy toward America. He de-

nounced the recognition of Independence, though he had formerly opposed the policy of taxation.

Estimate. Pitt holds an honoured place in English history not only as one of the greatest, perhaps the very greatest, of the country's war Ministers, but as the first successful public man who depended for his support, not on king or Parliament, but on the nation as a whole.

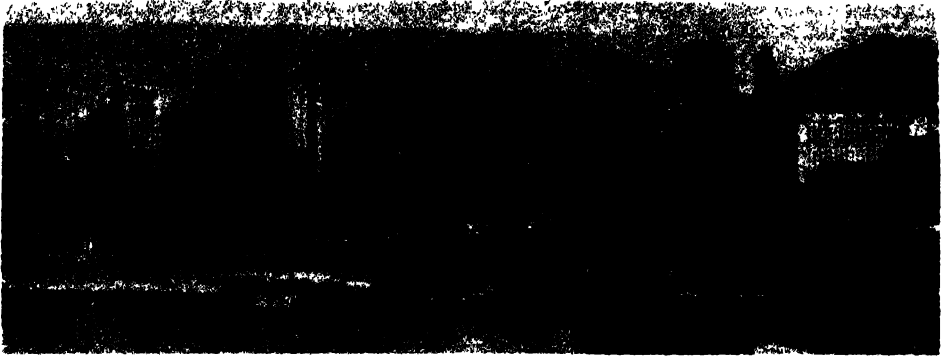
PITT, WILLIAM (1759-1806). Younger son of the above; is considered by many historians to be the greatest Prime Minister England has ever had. He was born at Hayes, near Bromley in Kent, and entered Pembroke Hall, Cambridge, when but 14 years of age. Of delicate health and somewhat austere manner, he made no friends at the university and took no part in its social life, but displayed a maturity and a capacity for learning which amazed his teachers. After taking his degree in 1776, he studied law and was called to the bar at Lincoln's Inn (1780), but never practised, for he began his Parliamentary career the following year. His very first speech attracted favourable attention; it was not unworthy of the man who later took rank with Edmund Burke and Charles Fox.

Prime Minister at 24. The first official position offered him Pitt declined, because nothing less than a Cabinet office could satisfy him; in 1782 he became Chancellor of the Exchequer in Lord Shelburne's Ministry. Meanwhile, he had shown his interest in Parliamentary reform by introducing a Bill in Parliament which was defeated by but a few votes. This interest was unabated until the stormy days of the French Revolution compelled him to abandon his efforts. After the Shelburne Ministry and the succeeding coalition government had been defeated, Pitt became Premier in December, 1783, when not 25 years of age. He had come to office at a difficult time, for the majority in the House of Commons was against him, and it was felt that he would soon be forced to resign; but supported by George III and the House of Lords, he persisted until, by his oratory and evident sincerity of purpose, he had won popular favour, and then, early in 1784, he appealed to the country. The general election gave him a large majority, and, except for the



THE YOUNGER PITT
Photo Brown Bros

PITTSBURGH



PITTSBURGH, THE BUSINESS CENTRE

interval between 1801 and 1804, he now ruled England till the close of his life.

Work as Finance and War Minister. His first problems were financial; these he met most successfully by many wise measures. He reformed the administration of the East India Company, abolished scores of well-paid but useless offices, negotiated a Commercial Treaty with France, and in 1786 established a sinking fund for the reduction of the National Debt.

His heart was in these economic measures, for he was pre-eminently a peace Minister, but he was forced to become a war Minister during a very troubled period in the history of Europe. As long as possible he refrained from interfering in the affairs of France, but in February, 1793, the revolutionaries declared war against Britain. In the conflict which followed, Pitt's policy had two aims—to defeat France on land and to destroy her power on the sea. Chiefly through the

about the Parliamentary union of Great Britain and Ireland, but to Roman Catholic emancipation, which he had intended to couple with the measure for union, King George III obstinately refused to give his consent. Pitt therefore resigned in 1801, and was succeeded by Addington, whom he supported as long as he conscientiously could. The war with France, brought to a close for a time by the Peace of Amiens, was reopened in 1803, and in the next year Pitt was again asked to take charge of the government. He formed a coalition with Russia and Austria against France, but the two allies were defeated at Austerlitz in December, 1805, and Pitt, already worn with the struggle, did not long survive the disaster.

PITTA. General name for a number of birds which form a distinct family (*Pithidae*). They are distributed mainly in southern Asia, Australia, and some in Africa. The majority are ground birds, generally about the size of a thrush. As a rule, pittas, particularly those of the East Indies, are very beautifully marked with contrasting colours. The elegant *pitta* of Borneo is one of the prettiest of birds.

PITTSBURGH, U.S.A. The eleventh largest city in the United States, with a population (1930) of 669,817; it is situated in the southwestern part of Pennsylvania, where the Monongahela and Allegheny rivers unite to form the Ohio River, about 340 miles west of Philadelphia and 430 miles west of New York. It is the centre of the

largest and most productive coalfields on the North American continent and of a highly productive oilfield. Pittsburgh also has many miles of river frontage.

The greater city has a population of about 1,500,000.

The unequalled abundance of cheap fuel



PITTSBURGH IN 1817

genius of Lord Nelson, the latter object was accomplished, but the British army was weak, and the war on land had to be conducted by allied nations which were aided by large English subsidies. These allies frequently failed to carry out Pitt's plans.

His Second Ministry. In 1800 Pitt brought

has attracted to the locality the great basic industries. The Pittsburgh district is not only the greatest coal-producing (bituminous), but the largest coal-consuming centre in the U.S.A.; natural gas, which formerly gave impetus to manufactures, is now used chiefly for domestic purposes. Some of the largest blast furnaces in the world and the most extensive plant for making steel rails, armour plate for battleships, and structural work for steel bridges are situated here.

The 4500 oil wells within a reasonable distance annually produce 1,500,000 barrels of oil; and from the refineries come yearly more than 12,000 tank cars of refinery products. The production of pig-iron is one-fifth that of the United States, and one-tenth that of the world. The manufacture of glass is also on a most extensive scale.

PITUITARY, *pil tū' it ari*. **GLAND**. A gland whose secretions control human growth and metabolism. See **ENDOCRINE GLANDS**.

PIUS, *pī' us*. The name of eleven popes, nearly all of whom have won a permanent place in history.

Pius II, pope from 1458 to 1464, was known before his accession as **AENEAS SILVIUS PICCOLOMINI**. He was born in 1405. His unusual ability was evident in his youth, and he was employed in several important posts while still a young man. Especially at the Council of Basle in 1431 did he show his powers, succeeding by his reasoning and his oratory in reconciling the Emperor Frederick III and the Papacy. He decided to take holy orders in 1445, and in 1456 he received the cardinal's hat. After his election to the papal chair in 1458, Pius attempted to organize a crusade against the Turks, but found the old enthusiasm hard to arouse.

He was a man of literary eminence, and one of the most learned scholars of his day.

Pius IV, pope from 1559 to 1565, was born in 1499 of an obscure family in Milan. He was named **GIOVANNI ANGELO MEDICI**, though his people were not related to the famous Medici of Florence. In his young manhood he was a lawyer, and as such was employed on several important diplomatic commissions, but later entered the Church, becoming archbishop in 1545, and cardinal in 1549. Early in 1562 he reassembled the famous Council of Trent, which continued its sessions until December, 1563, and at its close published the doctrines it had defined.

Pius V (Saint), pope from 1566 to 1572, was born in 1504, in Lombardy. His lay name was **MICHELE GHISLIERI**. He entered the Dominican Order in his fifteenth year, distinguishing himself by the severity of his life and his

asceticism. In 1557 he was made a cardinal, and in the following year he became grand inquisitor. In 1566 he succeeded Pius IV. He was zealous for reform, and promoted in every possible way the Counter-Reformation.

Elizabeth of England was excommunicated by him, and Charles IX of France was encouraged in his measures against the Huguenots. Most important of all his achievements was the formation of the Holy League, whose forces, led by Don John of



POPE PIUS IV

Photo: Victoria and Albert Museum

Austria, so thoroughly defeated the Turks at the Battle of Lepanto in 1571. Pius V was the last pope to be canonized.

Pius VI, whose secular name was **GIOVANNI ANGELO BRASCHI**, was born in 1717. He was elected to the papal chair in 1775, having been made a cardinal two years earlier. The early part of his reign was taken up with disputes with the Emperor Joseph II, who had declared that all the religious orders within the Empire were independent of papal control. More serious disturbances came later, however, after the outbreak of the French Revolution. During his invasion of Italy in 1797, Napoleon Bonaparte forced from the pope, who had favoured the allies, a treaty giving up certain territory; and in the next year the French entered Rome, proclaimed a republic, and carried off the pope, who died at Valence in 1799. See **NAPOLEON I**.

Pius VII (lay name GREGORIO LUIGI BARNABA CHIARAMONTI). A Benedictine monk; in 1785 he was created a cardinal. In 1800 he was elected to the Papacy and was allowed to enter Rome, although the city was in the hands of the French. As Napoleon was desirous of restoring religion to its former place in France, an agreement was concluded, and in 1804 the pope went to Paris and crowned Napoleon emperor. But Napoleon's encroachments on the papal authority and neglect of the agreement led to an open breach. In 1809, Napoleon declared the States of the Church annexed to French territory. The pope at once issued a bull of excommunication against the perpetrators of these outrages, not, however, mentioning Napoleon's name: he was in consequence arrested and taken to Savona and afterwards to Fontainebleau. After Napoleon's downfall, Pius returned to Rome, and the Congress of Vienna restored to him all the former territories of the Church. In 1814 he promulgated the order restoring the Jesuits. He died 20th August, 1823.

Pius IX was in the papal chair at the time of the formation of the kingdom of Italy, and was thus the last of the popes for nearly sixty years to wield temporal power. His original name was COUNT GIOVANNI MARIA MASTAI-FERRETTI. He was born at Sinigaglia in 1792, entered the Church in 1819, and by 1827 had risen to the rank of archbishop. In 1840 he was made a cardinal, and six years later, on the death of Gregory XVI, was elected pope. Before his elevation to the Papacy, he had shown liberal tendencies, and his earliest acts as pope seemed to promise an enlightened government; but the events of 1848 were too revolutionary, and in November of that year, he was compelled to flee from Rome, which proclaimed itself a republic. By the aid of the French, however, he was re-established.

He opposed the attempted union of Italy under Victor Emmanuel, and refused to yield or to make concessions until, in 1870, the French forces which had defended him in his temporal power were withdrawn, and Rome became the capital of united Italy. The pope, in protest, shut himself in the Vatican. His principal acts were the re-establishment of the hierarchy in England, and the defining, in 1854, of the dogma of the Immaculate Conception of the Virgin Mary (that she was conceived free of taint of original sin).

The Vatican Council—which assembled in December, 1869—the first Church council since that of Trent, asserted the doctrine of papal infallibility to be a dogma of faith. Pope Pius IX died in 1878. See ITALY.

Pius X (1835-1914), born GIUSEPPE SARTO, was elected pope in 1903. His family were humble peasants. His pontificate is notable for the condemnation in 1907 of a number of Modernist propositions. The personal holiness of Pius X made him greatly respected. He died on 20th August, 1914, his death having been hastened, it is believed, by grief over the outbreak of the World War.

Pius XI ACHILLE RATTI, the 261st occupant of the papal chair, was born 31st May,



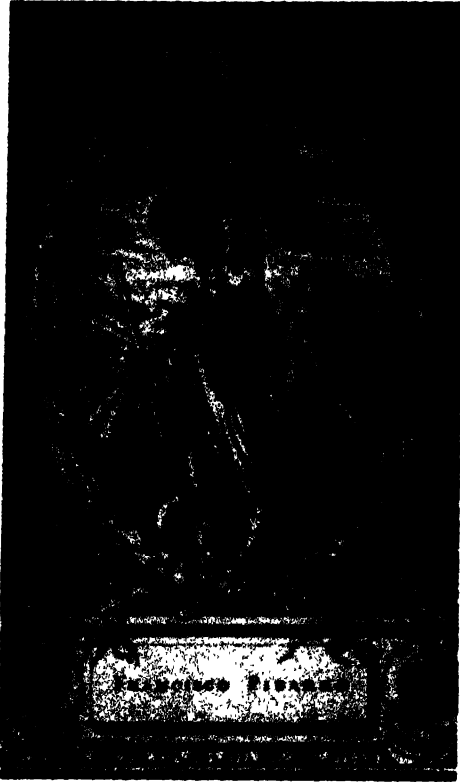
POPE PIUS XI
Photo Photopress

1857, of Italian parentage. He became in turn librarian of the Ambrosian Library, Milan, and of the Vatican Library. Later he was made Papal nuncio in Poland after the organization of that Republic in 1918. In 1921 he was appointed Archbishop of Milan and then cardinal (on 16th June) L. Benedict XV, whom he succeeded as pope less than a year later, on 6th February, 1922.

The outstanding event of his pontificate was the reconciliation of the Papacy with the government of Italy, including the restoration of the temporal power of the popes. The two main aspects of his work have been the promotion of foreign missions and the extension of diplomatic relations

both with Italy and with other powers. He has upheld the rights of the Catholic Church against State interference in Germany, and showed favour towards the Italian conquest of Ethiopia in so far as it gave promise of a new field for civilizing and missionary work. See VATICAN CITY.

PIZARRO, *pe sar' ro*, FRANCISCO (1471-1541). A Spaniard who rose from obscurity



FRANCISCO PIZARRO

Drawn from an old painting in Madrid.

to become a great explorer, and who crowned his life-work by conquering Peru. Pizarro accompanied Balboa on the expedition which discovered the Pacific Ocean; under another adventurer, in 1519, he received a grant of land in Panama and engaged in cattle-farming there. A few years later, forming a partnership with Diego de Almagro and Father Hernando de Luque, he explored the western coast of South America. In 1528 he persuaded Charles V to aid his explorations, and on 25th July, 1529, at Toledo, the famous agreement was signed making Pizarro Governor and Captain-General of the Province of New Castile for 200 leagues along the

coast. In 1530, with a band of followers, including four brothers, he reached Panama, leaving there in January, 1531, for Peru, and landing at Tumbes. Finding the country weakened by the struggle between Atahualpa, the reigning Inca, and Huascar, his brother, the legitimate monarch, Pizarro with only 100 men attacked the natives and captured Atahualpa and put him to death. Meanwhile, Almagro returned to his assistance with 150 more followers, and Cuzco was occupied by the Spanish. Lima, the first town colonized by Pizarro, was founded in January, 1535.

Pizarro began to develop the resources of the country, but in 1536 the Incas attempted to expel the Spaniards. Though they maintained their position, the invaders were weakened by dissensions until 1541, when Pizarro was surprised by the supporters of Almagro, his half-caste son, and mortally wounded.

PLACE-NAMES. Place-names have been a subject of perennial interest from the time when Bede explained Gateshead as *caput caprae* or *Streoneshalh* (now Whitby) as *sinus fari* "the nook or bay of a man called Streon" (*streon* meaning "strain, descent," like Latin *fara*). Until about 1850, and even until to-day with some writers, the subject has been largely guesswork, but through the work of the English Place-Name Society, it is now carried out on scientific lines. The underlying idea is that place-names are a form of language and are therefore subject to all the changes of language (see PHONOLOGY)—sound changes, reduction and racial adaptation. Thus, Chelsea was formerly *Cealchythe* "chalk wharf," Elstree was *Tidulfstreon* "Tidwulf's tree," Bloomsbury was *Blemondcsburi*, possibly named from a William Blemond who held land in Tottenham in 1200; Brighton is *Brighthelmstun* "farm of man called Brihthelm." Tring was originally *Thrithing* "a third part" (as in West Riding), and the modern form is due to the Normans, who could not pronounce *th*. The best example of racial adaptation, however, is York. This was a British name *Eburakon* (from *eburios* "a yew tree" with *-acon*, a place-name suffix). *Eburakon* was adapted by the Angles to *Eoforwic*, who already had in their language a word *eofor* "wild boar"; *wic* "farm" was added just as *chester* was added by them to other British names they took over, as Gloucester (British *Glevum*), Worcester (British *Wigornia*), or Manchester (British *Mancunio*). When the Scandinavians captured York, they substituted their form of the word *eofor*, which was *for*, hence *Jorvik*, later shortened to *Yorrick* and York.

These examples show that the first need

of place-name study should be to ascertain the oldest spellings of a place-name, and the best sources of such spellings are the Anglo-Saxon charters, Chronicles, Domesday Book, Court Rolls, Abbey Cartularies and other documents. The next stage is the establishment of the etymology, having regard to the known principles of name-formation. Celtic names are usually made up of two elements, a common element followed by a descriptive element (cf. Welsh names beginning with *Llan*- "church" and Irish names beginning with *Bally*- "farm"). In English and Scandinavian place-names the descriptive element comes first and is followed by the common element. This common element is always drawn from the common word-stock, as *ham* "homestead," *tun* "farmstead," *dun* "hill" (all Old English), *thorp* "hamlet," *by* "farm," or *gil* "ravine" (all Scandinavian). But the first element may be either a common word or a personal name. The cardinal points are common in names like Norton, Northorpe, Sutton, Aston, Eston, Weston, Westcliffe; tree names are found in Acton ("oak farm"), Oakleigh, Elmstead, Ashton, Asleigh; plant names in Guildford (from *gylde* "a marigold"), Furzedown (from *fyr* "furze"), Ampleforth (from *ampre* "dock, sorrel"); besides countless other words like *haeth* "heath" in Hatfield, Stepney, Hedley, *straet* "Roman road" in Stratton, Stretton, Stratford, *scucca* "a demon" in Shuckton, *draca* "a dragon" in Drakelow, all Old English. Scandinavian words are also common, as *steinn* "stone" in Stainburn, Stainton; *hest* "horse" as in Hesketh (actually "a race-course"); *ikorni* "squirrel" in Ickornshaw. When the first element is a personal name it is generally either Old English or Scandinavian, and it may be monothematic, as *Putta* (in Putney), *Bacca* (in Bagshot); diminutive, as *Godel* (in Goldsborough); or dithematic, as *Aelfred* or *Ielfred* (in Ilfracombe), *Godhelm* (in Godalming); or occasionally a nickname, especially in Scandinavian, as *Belgr* "a wrinkled old man" (in Bellerby), *Blanda* "one who mixes drinks" (in Blandsby), or *Skarhi* "a man with a hare-lip" (in Scarborough). The word *stow* is frequently combined with saints' names, as Wistow (Leicester) from Saint Wigstan, Instow from Saint John, Bridstow (Hereford) from Saint Bridget. Racial names are also found occasionally as first elements in names like Walton "farm of the Welshmen," Bretton "farm of the Britons," Ingleby "farm of the Angles," Denby "farm of the Danes," Normanton, Normanby "farm of the Norwegians."

It is essential that the etymology of a name should be a likely one on philological,

topographical and historical grounds. Before a name can be given a Scandinavian etymology, it must be shown that the Scandinavians had been in that part of the country. The Scandinavians did not settle in the south of England, and it is improbable that southern place-names could have Scandinavian origins; on these grounds the element *gill* common in the Weald in Sussex is not the same word as the northern *gill* (Scandinavian *gil* "ravine"), but is an Old English word *gyll* "ravine." So also the local topography must be considered when deciding whether a name like Redhill or Rawcliffe contains "red" (Old English *read*, Old Scandinavian *rauth*) or a personal name.

Taken broadly, place-names throw great light upon the earlier and darker periods of English history. The occurrence of names like Walton and Bretton, the survival of British names in London, Kent, Dover, Worcester, Gloucester, Lichfield, Cirencester, etc., and numerous river-names like Thames, Exe, Taw, Derwent, etc., of Celtic origin, as well as the use of British personal names by Angles and Saxons (e.g. *Caedmon* from British *Catumannos*, or *Cynebil* from British *Cunobelinos*, Shakespeare's *Cymbeline*), all suggest that the Britons were not all destroyed or driven into Wales; some undoubtedly mingled with the English, if only in a small capacity. With regard to the Anglo-Saxons, the chief interest of place-names is in determining the actual areas first settled. These are now known to be the coastal districts in the north-east and east and those parts of the midlands and south which were easily accessible by means of the Roman roads. The names which prove this are tribal names ending in *-ing*, like Tooting "the place of Tota and his dependants," Godalming "Godhelm and his people," Barking "Berica and his people," as well as place-names of heathen origin which must obviously pre-date Saint Augustine's mission: Harrow goes back to Old English *hearg* "heathen temple," Weedon (Bucks) contains *wroth* "a heathen idol," and some names in *-head*, like Gateshead "goat's head" (for another derivation, see article GATESHEAD), Swineshead, Manshead, may reflect early heathen sacrificial rites in which the victim's head was nailed to a tree. When we come to the Scandinavian settlement we have more historical evidence in Chronicles of the settlement of Danes in the ninth century and of Norwegians in the tenth; the extent can be determined from place-names. Names containing both "booth," *hulm* "meadow," *thorp* "hamlet," and *loft* "enclosure" are mostly Danish; those which contain *gil* "ravine," *slack* "hillside," *scale* "hut," and *breck* "slope" are Norwegian. The element

by, it should be noted, is found in both Danish and Norwegian names and was in actual use till after the Norman Conquest, as shown by the Cumberland name Allonby, which contains French *Alein*. The distribution of the foregoing elements indicates that the Danes settled in the more fertile parts of the country, in East Anglia, the Midlands, and especially Lincolnshire, and the flat parts of Yorkshire. The Norwegians, on the other hand, settled chiefly in the Lake District and the mountainous parts of Lancashire and Yorkshire. It can, moreover, be shown that the Norwegians settled in the north-west because they had come mainly from Ireland, where they had already been in occupation of the coastal districts for some time. From the Irish they had adopted certain words like *erg* "a shieling," as in Arras, Eryholme (Yorks); many Irish personal names like *Colman* in Commondale (Yorks), *Beccan* in Becconsall (Lancs), *Corc* in Corby (Cumberland); and the Celtic method of putting the common element first, as in *Aspatria* (formerly *Askpatrik* "Patrick's ash tree") or *Troutbeck* (formerly *Bektroyle* "Troite's stream").

PLACENTA. An organ which develops in the womb during pregnancy, whose function is to convey nourishment from the mother's blood to that of the future infant. At the time of labour it is a circular or oval soft mass, about 7 in. in diameter, weighing about a pound, and very richly supplied with blood-vessels, some of which belong to the mother's circulation and some to the infant's. The blood itself does not pass from one to the other, but nutritive substances in solution pass out through the walls of the mother's vessels and into the infant's. After the baby is born there is a short pause, and then the placenta with certain membranes follow, and are known as the after-birth. See OBSTETRICS.

PLAGUE. A malignant, highly infectious disease. At one time any disease of this type which was epidemic was called plague, but to-day the term is now used only of *bubonic plague*. The *black death* which devastated parts of Europe in the fourteenth century was plague. In its typical form it is marked by enlargements of the lymphatic glands, called *buboes*, whence has come the name *bubonic plague*. The disease is caused by a microbe, the *Bacillus pestis*, and is usually transmitted to man from rats and other rodents by the bites of fleas. The fact that we have none of these plague epidemics sweeping over the world to-day is a result of the advances made in sanitary science and preventive medicine.

An attack usually begins suddenly, with chills and fever, followed by headache and

pains over the body. Associated with these symptoms is swelling of the lymph glands, particularly those in the groin, armpit and neck. Ulceration of the buboes is common. In the pneumonic type of the plague, cough with bloody sputum is a characteristic symptom. There is no specific remedy, but injections of Haffkine's serum have been found useful in conferring limited immunity and lessening the severity of the symptoms. Even to-day there is a high death-rate.

The first visitation of the plague in Europe occurred at Athens in 430 B.C. One of the most disastrous epidemics of ancient times was that of Rome in 262 when 5000 persons succumbed daily. The disease was again brought to Europe by the Crusaders in the thirteenth century. From 1334 to 1351, China, India, Persia, Russia, Germany, Italy, France, England and Norway were devastated by the plague. In succeeding centuries the scourge continued to claim its victims, and between 1603 and 1665, London lost 153,900 souls. In Marseilles, in 1720, 60,000 succumbed in seven months. Constantinople lost 260,000 of its inhabitants in two epidemics (1803 and 1813).

Sanitary precautions in regard to drainage, campaigns against rats, and strict quarantine regulations have brought the disease under control in enlightened countries, but there are always some cases in every continent except Australia. ~

PLAICE. The best known of the flat-fishes, the plaice has a high commercial value and is abundant almost everywhere in European seas. The North Sea plaice fishery is important, though latterly this, with other areas, has shown signs of over-fishing and has been the subject of international experiment in the transplantation of immature fish. The plaice is a ground-living fish, feeding mainly on mollusca. The eyes are on the right side, and the brown upper surface is liberally spotted with red. It is a valuable food fish. For an illustration, see the article FLATFISH.

Scientific Name. Pleuronectes platessa.

PLAIN. A broad and level expanse of land, generally rising not more than 1000 ft. above the sea. There is often no line of separation between a plain and a plateau. Most inland plains have a rich soil, capable of producing abundant crops in favourable weather, and transport is also a simple problem; such regions are therefore generally well populated.

Coastal Plain. This is a stretch of lowland extending along a sea-coast, and sloping gently towards the adjacent floor of the sea. Such a plain in many cases was formerly covered by the sea, and is composed of

material washed down from the mountains by rivers. This material, by a gradual process of accumulation, builds up a plain on the sea floor which may be uplifted to become a part of the land area of the continent.

Flood Plain. This is a plain formed of sediment deposited by the overflow of a river. Floods in high regions carry off quantities of earth and other matter, which are deposited lower down in the plains by the flooding of the river valley. The overflowing waters lie practically still on the surface of the land, and a natural deposit occurs. In these flood plains, the deposits are so light that the river is constantly washing out new channels.

The nature of the deposit varies greatly, and is governed by the violence of the flood and the nature of the country through which the stream passes. A raging torrent will carry gravel, stones, and even small rocks, while a flood of less violent proportions might carry only light gravel; sluggish waters would contain only fine silt. A flood plain may be caused by a bank or bar across the river mouth, compelling the river to drop its load, which gradually accumulates until sometimes it forces the river from its original channel. The Rhine, the Po, and the Ganges are remarkable for their flood plains, but in none is the action of the river in forming them so clear as in the case of the Nile.

PLAIN-SONG. The name given to those ancient church melodies in slow and simple measure which formed the basis of so much medieval music; also known as Plain-chant, and (after Saint Gregory the Great, who re-ordered the musical scale in A.D. 590) as Gregorian chants. The plain-song service is still in use to-day. It is, as such, properly without harmony; but round about A.D. 1200 the art of adding one tune to another (counterpoint) was largely developed by taking a plain-chant as the basis upon which to add a further tune, or Descant. For the development from these origins of the school of contrapuntal music, which reached its height in Palestrina, Byrd and Gibbons, see under Music.

PLANGE, MAX. Originator of the Quantum Theory (which see).

PLANE. A term generally denoting a perfectly flat surface—a surface such that the straight line joining any two of its points lies wholly within the surface.

A *curvilinear* plane is one produced by a curved line moving through space in a fixed direction.

PLANET. Heavenly bodies, apart from the moon, that shine with a steady light. Because of their constant change of position, the ancients called these bodies *planets*,

meaning "wanderers." Like the earth, they move around the sun in paths called *orbits*. Named in the order of their distances from the sun, the planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune and Pluto. Six of them, Mercury, Venus, the Earth, Mars, Jupiter, and Saturn, were known to the ancients, but they did not recognize that the earth is a planet. Uranus was discovered by Sir William Herschel in 1781, and Neptune by mathematical calculation in 1846. In 1930, a new planet, Pluto, was discovered at a great distance beyond Neptune.

Venus, Mars, Jupiter and Saturn are easily seen with the naked eye. Mercury is seldom seen because it is so near the sun. Uranus may occasionally be seen by an observer with a keen eye under favourable atmospheric conditions, but in order to see Neptune, one needs a pair of good binoculars or a small telescope.

Sizes and Distances from the Sun. The planets differ widely in respect to size. Mercury, the smallest, is about one-sixteenth the size of the earth, while it would take over 1300 earths to make a planet as large as Jupiter. Venus is almost as large as the earth; Mars is only one-seventh the size of the earth. Saturn is 730 times larger than the earth, Uranus sixty-four times, and Neptune sixty times larger than the earth. But the amount of matter in a body depends upon both its volume and its density, or mass, and the mass of the planets varies as greatly as their volume. For if the earth be considered to have one degree of density, one equal volume on Jupiter would have over 300 times the density.

The distances of the planets from each other increase with their distances from the sun.

Classification. Humboldt classified the planets into two groups—the *terrestrial* and the *major* groups. The first group includes Mercury, Venus, Earth and Mars, and was given its name because our planet was one of its members. The group of major planets—Jupiter, Saturn, Uranus and Neptune—were so named because of their great size. Between the terrestrial and major planets is a great space in which are found a large number of small planets called *asteroids*, or *planetoids*.

Another method of classification divides the planets into *inferior* and *superior* groups, the former including planets whose orbits lie between the earth's and the sun, and the latter including those whose orbits lie beyond the earth's.

Movements of the Planets. Every planet has two motions—a revolution around the sun and a rotation on its axis. The time

NAME	DISTANCE IN ASTRONOMICAL UNITS	YEAR OR PERIOD	DIAMETER
Mercury	0.4	3 months	3100 miles
Venus	0.7	7½ months	7700 "
Earth (basis of measurement)	1.0	1 year	7918 "
Mars	1.5	1 yr. 10 months	4300 "
Asteroids	3.0	3 to 9 years	500 to 10 miles
Jupiter	5.2	11.9 years	86,700 miles
Saturn	9.5	29.5 "	71,500 "
Uranus	19.2	84.0 "	32,000 " ?
Neptune	30.1	164.8 "	31,000 " ?
Pluto (discovered in 1930)	39.6	249.17 "	?

required for a complete revolution in its orbit constitutes the year or period of the planet; the time required for its rotation constitutes its day. Because of their smaller orbits, the terrestrial planets have shorter years than those of the major group, but the major planets rotate on their axes more rapidly than the smaller ones. Jupiter's day, for instance, is less than one-half of our day.

See ASTEROIDS; ASTRONOMY; SATELLITE.

PLANETARIUM. A model of the solar system. The earlier forms consisted of balls moved by clockwork, to represent the movements of planetary bodies. One of the best of this type was made by Graham and called an "Orrery," after the fourth Earl of that name, in the early part of the eighteenth century.

The modern planetarium is of an entirely different type. It projects images of the heavenly bodies on the interior of a dome, by means of an instrument which operates on the principle of the stereopticon, or "magic lantern." The stars and planets are shown by points of light instead of balls or globes, as in the older devices.

The idea of the modern planetarium was originated in 1903 by Dr. Oscar von Miller, of Munich. The first complete mechanism embodying his ideas was constructed by the Zeiss optical works, and installed in the Bavarian National Museum in Munich, of which Dr. von Miller was director.

The most advanced types now illustrate the movements of the stars and planets, their relative size and brightness, the precession of the equinoxes, and other astronomical events.

The essential features of a planetarium include a hall with domed ceiling, on which star images are projected; the projection machine; and the switchboard for controlling the lights. The projector is a cylindrical machine, with many lenses and a powerful electric lamp. It is mounted on wheels, and can be swung to and fro on its frame. An idea of the complexity of the machine may be gained from the statement that 119

optical projectors are required to illustrate the motion of a celestial body.

The lecturer demonstrates on the artificial sky the facts which he wishes to illustrate. For a pointer, he uses a flashlight. He is able to show the path of any planet, the clusters of stars in the Milky Way, the causes of the changing seasons, and the pageant of the sun, moon and stars in movement.

PLANETOID, *plan'et oid*. One of many small planets usually called *asteroids*, revolving about the sun in the gap between the orbits of Jupiter and Mars. See ASTEROIDS; SOLAR SYSTEM.

PLANE TREE. A handsome shade tree and possibly most popular of London trees, this is a comparative newcomer to England,



PLANE LEAF
Photo - E. J. Hoshing

being native to Asia Minor. It grows to a height of 120 ft. and is distinguishable by its large hand-shaped, lobed leaves, vividly green and with serrated edges. The bark is smooth and grey, but as this peels off, the trunk has a dappled look. The flowers, and later the fruits, are tightly clustered



PLANE TREE IN SUMMER

Photo: E. J. Hocking

together, so that they give the appearance of numerous little balls about 1 inch in diameter. The plane tree very much resembles the sycamore in habit and leaf formation. See SYCAMORE.

Scientific Names. The plane belongs to the family *Platanaceae*. The oriental plane is *Platanus orientalis*. The London Plane is *P. acerifolia*.

PLANING MACHINE. An adaptation of the principle of the ordinary hand plane to machinery for planing or smoothing wood and metal. It is usually operated by steam, petrol engine or electricity. As used for planing wood, it consists of a drum with cutters attached, rotating on a horizontal axis. The wood to be planed or smoothed passes underneath the drum.

In metal planers, the object to be smoothed is fixed to a traversing table and is moved against a stationary cutter.

PLANKTON. The collective name applied to the vast numbers and varieties of minute animal and vegetable organisms which drift in the sea and in fresh water and form an important part of the diet of many fishes.

PLANT. Any living thing which is not an animal. The exact dividing line between animals and plants the most skilful scientist has never been able to draw, so simple are the lowest forms of both. Many animals among the lower forms, such as the adult sea squirts, remain fixed all their lives and attempt no progression, while, on the other hand, many plants make movements entirely

of their own accord. For instance, the Venus flytrap shuts upon an intruding insect, and the tendrils of any climbing plant coil about the nearest support. Almost all that can be said definitely is, as one author puts it, that "most animals move more freely than do most plants." There are many other partial definitions, including the method of food ingestion, or absorption. Best of all distinctions, probably, is the possession of chlorophyll by plants, with exceptions covering the fungi, bacteria, and a few miscellaneous groups.

In the article **ANIMAL** are discussed the chief differences between plants and animals—the different gases which they take into their bodies, their methods of digesting food, and, very important indeed, their requirements as to food.

The presence of hot lava, excessive deposits of salt or alkali, and long-continued extremes of heat and cold, are almost the only conditions which make it impossible for plants to live. Plants, of course, are not equally numerous everywhere, nor do like plants usually grow under widely differing conditions. Yet the desert cactus is as truly a form of growing plant life as is any luxuriant plant of the tropical forest; it is suited to the unfavourable conditions under which it grows. It has thick, juicy leaves which store up moisture and enable it to live for long seasons without rain.

Directly or indirectly, every animal in the world is dependent upon plants for food, and man is hardly less so. The grazing animals and those that live upon roots, leaves, etc., are immediately dependent, but even the flesh-eating animals owe life to plants, for it is on plants that their prey is fed.

Evolution of Plants. Scientists no longer believe that every variety of plant was brought into the world separate and distinct from every other variety; to plants as well as to animals they apply the doctrine of evolution (which see). That is, they believe that all plant forms, however complex, have developed through unnumbered ages from the simplest one-cell forms. First to emerge from the single-cell life, they believe, were the algae, and from them the liverworts developed and the fungi degenerated. Out of the liverworts arose the mosses, from them the ferns, and from the ferns, finally, the flowering or seed plants. Incredibly slow was the process, and by no means all of its steps have been traced, but enough has been learned from fossil and intermediate forms to convince most students.

The processes of growth and change still go on, though often too slowly to be visible, and man with all his study and with all his

plant breeding can only assist in it. This assistance, too, is under definite limitations. Through well-considered hybridization, and subsequent selection and breeding, the plant scientist has made fruits, flowers and seeds larger, but apparently he has not been able to stimulate or induce marked evolutionary changes. The seedless orange was a natural "sport," and the cactus without thorn existed long before it was utilized in breeding.

Propagation. Most of the plants which are of more vital interest and use to man are of the flowering and seeding type, and many plants cannot be propagated otherwise; with the majority of kinds, seed produces the strongest plants, which are best adapted to their environment. The improvement of cereals, vegetables and flowers from the original wild species has been achieved by the process of breeding and selection made possible by the fact that most plants can be cross-fertilized. With woody plants and fruit trees, this selection has been accomplished by budding or grafting the desired varieties on to strong-growing stocks. A great number of plants and trees may also be propagated by cuttings, which can usually be relied upon to reproduce the parent variety; they are placed in moist, sandy soil. Some plants, again, such as the strawberry, reproduce themselves by runners; and many others which send out long flexible shoots can be induced to form new plants in a similar way by "layering," or pegging down shoots, previously slit, to the ground. Such are the loganberry, carnation, jasmine, etc. Most bulbous plants form offsets which may be detached and planted; some, like the lily, produce "bulbils," or miniature bulbs, in the leaf axils; and others, like the gloxinia, will form tiny bulbs upon the rib of a leaf laid with the underside upon moist soil.

See BOTANY; BULBS; GRAFTING; SEEDS.

PLANTAGENET, *plan taj' en et*. A surname derived from the words *planta*, meaning "sprig," and *genista*, the generic name of the broom plant. It was applied to Geoffrey, Count of Anjou, founder of the Plantagenet family, because of his wearing a branch of broom in his cap (see BROOM). Fourteen English monarchs bore this name, from 1154 to 1485. The family was divided into the York and Lancaster branches in the fifteenth century.

PLANTAIN, *plan' tin*. The common name of a genus of low-growing herbs. The common or broad-leaf plantain, may be recognized in the spring by its rosette of broad, light-green leaves, which grow from the roots. From the centre of the leaf clusters are sent up tall, slender spikes, densely covered, all through summer, with a succe-

sion of tiny green flowers. This weed is spread by the birds, which eagerly feast on the seeds and help to scatter them about. Another well-known species is the narrow-leaf plantain, or *ribwort*, with narrow leaves and short, thick spikes.

There is also a tropical plant of this name, whose fruit closely resembles the banana.

Scientific Names. The plantain genus is known botanically as *Plantago*, family *Plantaginaceae*. The broad-leaf plantain is *P. major*; the narrow-leaf is *P. lanceolata*.

PLANT BREEDING. See AGRICULTURE; PLANTS.

PLANT LICE. See APHIDES.

PLASMA, *plas' ma*. See BLOOD.

PLASMIDIUM, *plas mō' dium*. See SLIME MOULDS.

PLASSEY, BATTLE OF. See CLIVE, ROBERT.

PLASTERING. The application of mortar or other plastic material to the walls and ceilings of buildings, or for exterior use to outside walls, ornamental fences, and gateposts. In interiors, it is used for purposes of hygiene and decoration. Its smooth, hard surface presents few hiding-places for dirt or breeding-places for germs. It is, moreover, a surface suitable for taking wallpaper, paint, or calcimine. Outside plaster work is usually classed as *stucco*.

Preliminary to plastering, the walls or other surfaces must be prepared to receive the plaster. In some instances, the plaster is applied directly to the rough brick wall, in which case it is necessary to clean and dampen the wall to be surfaced. The usual method, and by far the best, is to fur out by nailing vertical furring strips of 1 in. by 2 in. wood, placed 12 in. or 16 in. apart, directly to the wall. These strips are plumbed up with wedges driven in behind them until they form a vertical plane on which to nail the laths. This forms an air space between the wall and plaster, which acts as an insulator from heat, cold, and dampness.

The laths are nailed in place on the furring strips in parallel rows, spaced $\frac{1}{2}$ in. apart to allow the plaster to be forced through and partly over the back of the lath to form a key or hook. This key is what keeps the plastering from separating from the lath and falling. The laths are nailed on in panels of about 18 in. in width, and staggered so that there will not be a continuous joint on any support.

In frame construction and on ceilings, the laths are nailed directly to the studding or joists. Tile blocks used for partition walls are cast hollow and have dovetail grooves on the outside faces to key the plaster. *Grounds* are square wood strips the thickness of the finished plaster ($\frac{3}{4}$ in. for three-coat work). These strips are nailed around all openings and along the bottom of the walls

to form an end or stopping-place for the plaster. This step aids the plasterer in making the wall a uniform thickness, and also furnishes a nailing strip for the trim. *Corner beads* are nailed to the laths on all exposed corners or edges. They protect the plaster from being chipped off.

Plaster is a composition of slaked lime and a fine-sieved sand. After slaking, clean sharp sand is added in the proportion of two parts sand to one part lime. Long, clean cattle hair or fibre is added as a binder. The rough mass is now allowed to stand about seven days, so as to become thoroughly moist. This mortar is known as first coat, and is worked to a smooth, tough consistency when ready to be used. It is spread firmly over the laths in a coat about $\frac{1}{4}$ in. thick, with enough pressure to force it between and through the laths to form the key. When almost hard, it is scratched with a wood comb, to form a key for the second coat.

The second, or brown coat, is prepared by mixing one part slaked lime with three parts sand and adding a slightly less quantity of hair. It is applied after the first coat is thoroughly dry. During the process of applying this coat, the wall is straightened and trued up plumb.

The third coat is in the form of a stiff paste made up of lime putty and equal parts of plaster of Paris and marble dust, or lime putty and manufactured hard wall plaster. It is put on with a steel trowel, and is thoroughly worked over and brushed to a hard, smooth surface. A sand-finish wall is made by mixing lime putty and clean beach sand, this plaster being put on with a wooden float.

PLASTER OF PARIS. If gypsum is ground and then baked to drive off the water, a fine dry powder, called plaster of Paris, is formed. From mixing one part of this powder with two parts water, a thin paste results, which hardens quickly on exposure to the air. This property of plaster of Paris makes it valuable for casts and for stucco work. By adding a small quantity of lime to the paste, *calcine plaster*, a very hard substance resembling marble is produced. This mixture is often used for fastening fixtures in place, where screws and bolts cannot be used. See GYPSUM; STUCCO. For painting on plaster, see FRESCO.

PLATA, RIO DE LA. See RIO DE LA PLATA.

PLATAEA, plá'te' a. See THEBES.

PLATEAU, plat' o. An elevated plain. Plateaux owe their formation to the same movements that created mountains. The distinction between a plateau and a plain is chiefly one of altitude, the latter being generally not more than 1000 ft. above sea level. Plateaux are also more rugged, and,

because of their higher altitude, their streams cut deeper valleys than do those of plains.

The loftiest plateaux on the earth are found in the regions north of the Himalayas—"the roof of the world."

PLATE GLASS. See GLASS.

PLATINUM. A rare precious metal. Though widely distributed, platinum is found in sparse quantities, considering the demand for it.

Platinum ore was discovered originally in Peru about the middle of the eighteenth century by Spanish pioneers who gave it a name derived from their word for "silver,"



LONDON PLATINUM REFINERY

There is over £1500 worth of metal in the nearest crucible.

Photo. Topical

since it resembles silver. This ore, called *native* or *crude* platinum, is usually found in beds of gold-bearing sands or other alluvial deposits; the miners call it "white gold." It occurs mostly in small, irregular grains which also contain other rare metals, such as iridium, osmium, rhodium, palladium, and ruthenium, in addition to a little iron, copper, chromium and titanium. Occasionally, large nuggets of native platinum are seen; a lump weighing more than 21 lb. was found in Russia in 1843. The ore contains from 60 to 85 per cent of pure platinum.

Properties. Platinum is a chemical element (symbol Pt). It is greyish-white in colour and is one of the heaviest substances known, being about twenty-one times as heavy as water. It is highly malleable and ductile, and in these properties is surpassed only by gold and silver. It melts at a temperature of about 3200° F.

Platinum is not oxidized in air, and it is not attacked by any of the pure acids. It dissolves only in *aqua regia* or nitro-muriatic

acid and in mixtures which generate chlorine. Platinum combines directly with phosphorus, arsenic, silicon, and with almost all other metals. It forms useful alloys with gold, silver, steel and iridium.

Uses. On account of its power of withstanding heat and the action of chemical reagents, platinum is much employed as a material for making vessels and crucibles which are used in chemical laboratories. In the manufacture of sulphuric acid it acts as a catalyst (see CATALYSIS). It is especially useful in chemical experiments in the fixation of atmospheric nitrogen. Platinum is valued by makers of expensive jewellery, for it is considered to be the best setting for precious gems. The alloy of platinum with iridium possesses an excellent and unalterable surface for fine engravings. The standard units of weights and measures are made from this alloy, and it is also used for making contact points in electrical equipment, points of fountain pens, and surgical instruments. The salts of the metal are valued in photography.

Production. The Ural Mountains in Russia contain the largest known deposits of platinum. Colombia, Peru, Australia, Borneo, the United States, Brazil and South Africa are other producing countries. Collectively, the British Empire is now the greatest producer.

PLATO (427-347 B.C.). One of the greatest among Greek philosophers, he was born either in the island of Aegina, or at Athens.

His father was Ariston, a descendant of Codrus; his mother, Perictione, was said to have been of the line of Solon. In his youth he received the customary education of the age, and tradition states that he wrote poetry and won distinction in gymnastics; also, that through the influence of Socrates he turned to philosophy at the age of



PLATO
Photo: Mansell

20. Without positive basis of truth, it is also said he travelled extensively in Greece, Sicily, Italy, Egypt and Northern Africa, and that Dionysius of Syracuse sold him into slavery at Aegina, though friends rescued him immediately. In 387 B.C. he was in Athens, and there established his school in the "Academy," a park near Athens.

His greatest work is the *Republic*, in which are outlined plans for an ideal State. Its method was to be the training of citizens to become virtuous; its aim, the attainment of

true justice. Although Plato realized that this ideal commonwealth could never be attained in an imperfect world, he held it up as an end toward which all should strive.

It is practically impossible to formulate Plato's system of philosophy in a few sentences. An eighteenth-century writer thus summarizes it, and his view accords with twentieth-century thought—

"Platonism appears as the most Greek of all philosophies, since it does not, like the Ionian and Eleatic doctrines that preceded it, reflect merely a single peculiarity of a single stock, but has included within itself all previous philosophy and reflects the Greek spirit as a whole."

It falls naturally into three classes: dialectics (or logic), physics and ethics. It became an idealistic, rather than a realistic, theory of things. Plato accepted Socrates' doctrine of virtue, that virtue is dependent on knowledge, and that truth and the good exist inseparably. From a study of the particular virtues, he rose to a conception of virtue in general. He said that individual things are fleeting; the general idea alone is permanent. The tree, the man, the flower pass away and change; the general concepts—tree, man, flower—however, remain unchanged. The general concept, or the *Idea*, therefore alone has true being.

The Doctrine of Ideas was built up from such reasoning. Just as there is a material world known through our senses, so there must be another, immaterial world of our ideas, of which we cannot gain any knowledge through our perceptions. Thus are the claims for an "immaterial reality" consciously and fully expressed, and a doctrine of Idealism expounded. Through it all run two persistent threads: "Reason guiding will is the supreme factor," and "There is identity between the true and the good."

There is no evidence that any of Plato's writings have been lost, but many works formerly accredited to him are now regarded as not his. His works are all in the form of dialogues, in which he had great skill. The important ones include *Laches*, *Charmides*, *Lysis*, *Protagoras*, *Io*, *Meno*, *Euthyphro*, *Parmenides*, *Crito*, *Phaedo*, *Symposium*, *Phaedrus*, *Cratylus*, *Gorgias*, the *Republic*, and the dialectical or argumentative dialogues *Timaeus*, *Critias*, *Theaetetus*, and the *Laws*. The dialogues *Crito* and *Phaedo* refer especially to the trial and death of Socrates, who appears in each of them as the man of ideal piety, the reformer, the law-abiding citizen, and the recluse pondering on eternal themes.

PLATYPUS, *plat' ip us*. See DUCK-BILL.

PLAUTUS, *plaw' tus*, TITUS MACCIUS (about 254-184 B.C.). Comic poet and dramatist of ancient Rome, born at Sarsina, a

village of Umbria. He was forced to earn his living by turning a handmill for a baker. While thus employed he wrote three plays, and their sale enabled him to forsake the drudgery of this work and enter upon a literary career. This was in 224 B.C., and for forty years he wrote popular dramas.

He is said to have written at least 130 plays; of these only twenty are now extant, and it is even uncertain that he was the author of all of these. He borrowed from Greek comic drama, but his own distinct contributions were the development of the farcical element, the vigour of his character delineation, and the emphasis on national (Roman) elements.

Later dramatists, even the greatest of them, have found much in the comedies of Plautus to imitate. The best known of his plays, however, is *Miles gloriosus*, in which a boastful captain is finally exposed as a coward—a popular character for comedy of later centuries and in many countries.

Among the works generally credited to Plautus are *Amphitruo*, *Aulularia*, *Bacchides*, *Captivi*, *Casina*, *Cistellaria*, *Menaechmi*, *Mostellaria*, and *Trinummus*.

PLAYING CARDS. See CARDS, PLAYING.

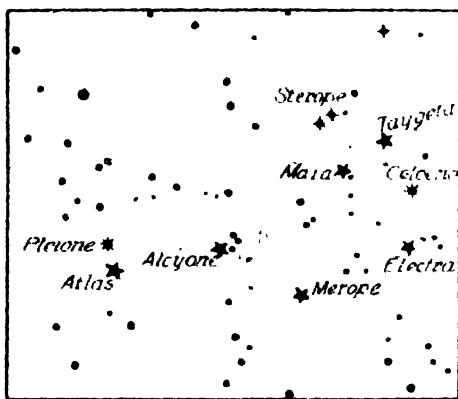
PLEBEIANS, *ple be' ānz*. The lower class in ancient Rome, as opposed to the patricians. Originally there was no such class, the population of Rome consisting only of the patricians and their slaves and "clients," who had neither political rights nor personal freedom. As the Latin towns in the territory about Rome were gradually brought into subjection, numbers of their inhabitants were either taken or went to Rome, and while a few were admitted to the patrician ranks, most of them were treated as subject aliens. They formed the nucleus of the plebeian order, which in time far surpassed the patricians in number.

The plebeians might hold land, but they had no political rights, and they were not even allowed to intermarry with the higher class. Some few privileges were allowed them under the later kings, but it was not until the time of the republic that they made a determined stand and demanded equal rights with the patricians. After they had gained permission to appoint tribunes to protect their interests, their progress toward political equality was rapid, and in the third century B.C. the two classes were made practically one, with no distinction before the law. See PATRICIAN; ROME.

PLEBISCITE, *pleb' is it*. Term generally used to denote a decision of a whole nation on a matter which has been put to universal vote. It is in principle equivalent to a Referendum. An example of such a plebiscite is the election of Napoleon III as ruler

of the Second Empire in France in 1852, following the downfall of the Second Republic. The more modern use of the word is in its application to a vote by the inhabitants of a particular district as to the sovereign powers over that district; for example, by the Treaty of Versailles, the administration of the Saar District of Germany passed to the League of Nations for 15 years, after which period the inhabitants were to decide by plebiscite whether they should return to Germany or become part of France. They desired to return to Germany.

PLEIADES, *ple' ad eez*. A constellation containing seven chief stars, of which six are visible to the naked eye; the seventh is easily discernible with the aid of a small telescope. Observers with keen eyesight can



see additional stars, and it is said that Maestlinus, the tutor of Kepler, "could reckon fourteen stars in the Pleiades, without any glasses." With a large telescope, several hundred can be seen, and photography reveals thousands of stars in this region.

According to legend, the seven stars are the daughters of Atlas and the nymph Pleione, who were transformed into stars by the gods and placed in the sky. The six visible stars form a small group and are named Electra, Maia, Taygeta, Alcyone, Atlas and Merope. The faint one, Sterope, is said to hide herself in shame because she alone married a mortal.

PLEISTOCENE, *plis' tō seen*, **PERIOD.** See GEOLOGY; ICE AGE.

PLESIOSAURUS, *ple sō saw' rus*. Name given a genus of reptiles belonging to the extinct group *Sauropterygia*; the name is often used simply for all members of the group. Plesiosaurs were perfectly adapted for a predaceous and amphibious life; there was a small head with many sharp teeth, a long neck, and limbs developed as

paddles; body and tail being comparatively short. Later types had either a very large head, short neck and big paddles, or a neck often half the total length, a small head and small paddles. The length was as much as 30 ft. Plesiosaur remains are found from the Rhaetic to the Upper Cretaceous, and are common in the Lias at Lyme Regis, Dorset.

PLEURA, *plu'ra*, THE. A double sac of thin, watery (serous) membrane. The inner bag, called the *pulmonary pleura*, covers the lung; the other, the *parietal pleura*, covers the cavity of the chest, the *thorax*. When in a healthy condition, the two sacs touch each other, and a fluid, as in other serous membranes, moistens them continually; thus the motion of the lungs against the thorax in breathing is smooth and painless. There is a pleura for each lung.

Although the two layers of the pleura do touch one another, still there is a potential space between them, known as the *pleural cavity*. In it there exists a negative pressure which continually exerts a pressure outward on the lungs, and so keeps them expanded.

In certain diseased conditions, the pleural cavity may lose its negative pressure. Then, because there is nothing to keep the lungs expanded, they collapse and are no longer capable of filling with air. This condition may occur whenever anything pierces the chest and allows the outside air to enter, such as a bullet wound. The pleural cavity sometimes becomes an actual cavity through filling with fluid or blood. Such a condition is very serious.

There are two pleuræ, the right and left. They touch at the middle of the *sternum*, or breastbone, and so form a wall for the other organs of the chest. Inflammation of the pleura causes the disease known as pleurisy. See LUNGS; PLEURISY.

PLEURISY. Inflammation of the serous membrane that lines the inside of the chest and covers the lungs (see PLEURA, THE, LUNGS). In health, these two surfaces of the membrane, being smooth and moist, glide over each other with every breath we take, without any perceptible movement. When the pleura is inflamed, the surfaces become dry and rough and rub together, causing intense pain in the side. Chills and fever, difficult breathing, and a short, dry cough are all characteristic symptoms of an attack of pleurisy. In a few hours a small quantity of fluid is poured out in the pleural sac, which in favourable cases, relieves pain and is absorbed. Sometimes, however, the effusion is so large as to compress the lung. Physicians usually distinguish these forms as dry pleurisy and pleurisy with effusion.

An attack of dry pleurisy is treated by rest in bed, hot baths, the application of a

mustard plaster, and strapping the chest to limit the breathing movements. Pleurisy with effusion sometimes requires the operation of tapping the chest to draw off the fluid. Sometimes the fluid becomes infected and is turned to pus; this condition, which especially necessitates operation, is called *empyema*, and is a serious complication of pleurisy.

Attacks of pleurisy are often brought on by exposure to cold; these cases are nearly always associated with tuberculosis. They may also come about by extension to the pleura of morbid conditions in neighbouring organs, such as pneumonia, or abscess of the breast, or from a fractured rib, etc.

Pleurisy often leaves behind it fibrous adhesions which bind the two layers of the pleura together at the points where they occur.

PLIMSOLL, SAMUEL (1824-98). The promoter of the Merchant Shipping Act of 1876; he was born in Bristol. He was honorary secretary of the Great Exhibition of 1851 and in 1868 became Radical M.P. for Derby. He devoted all his energies to the reform of the Shipping Acts, particularly in the direction of securing the safety of sailors by checking overloading. The Act of 1876 required every ship to be marked amidships with a horizontal line (the "Plimsoll Mark"), indicating the maximum depth to which the ship was to be allowed to sink when loaded.

PLINY, *plin' e*. The family name of two distinguished Roman writers, uncle and nephew, known as THE ELDER and THE YOUNGER.

Pliny the Elder, or GAIUS PLINIUS SECUNDUS, was born in A.D. 23 and died in 79. From Northern Italy, where he was born, he went to Rome while but a boy. As a soldier, he distinguished himself in the wars with the Germans; his later attempts to practise law were unsuccessful, and he withdrew to his estates at Novum Comum. In 71 he was in Spain as procurator, and on returning to Rome two years later, he adopted his nephew, who became known as Pliny the Younger. Under the Emperor Vespasian, his personal friend, he received various offices and commissions.

Whether at home or travelling about the Empire on business of state or for recreation, Pliny never ceased his systematic studies; he read constantly, and his fund of information became the marvel of later ages. In 79 he was in command of a Roman fleet off Naples, during the eruption of Vesuvius which destroyed Pompeii and Herculaneum. Desiring to observe the effects as closely as possible, he landed at Stabiae, and there met his death from the poisonous fumes following the eruption.

The only one of his works which survives is his *Natural History*. It has no great scientific merit, but contains a vast amount of information on ancient life and ideas which is not elsewhere available.

Pliny the Younger (A.D. 61- ?); whose name in full was **GAIUS PLINIUS CAECILIUS SECUNDUS**, was born at Novum Comum. Before his twentieth year he was known as one of the most learned men of the time. He studied under Quintilian, was a popular orator, and held a number of offices, serving in succession as military tribune, quaestor, praetor, and consul. The last known date in his life is 111, the year in which he was made *propraetor* of Bithynia. Besides his eulogy of the Emperor Trajan, nothing of his writings remains except his letters, which reveal him as taking an active part in political and social life and devoting his leisure to culture and learning, and at the same time show his mastery of prose style. Two of his letters are famous: one written to the Emperor Trajan describing the life and observances of the growing body of Christians in Bithynia and asking for advice on how to deal with them; the other giving a vivid account of his father's death in the eruption of Vesuvius and of his own experiences on that occasion.

PLIOCENE, *pli' o seen*, **PERIOD**. The closing epoch of the Tertiary Period, succeeding the Miocene Period. (The name, which is from the Greek, means "more recent.") The epoch was characterized by great extension of the land area, so that all the continents except Australia and Antarctica became joined in a single huge land-mass, and the seas were restricted to the deeper basins. Hence Pliocene rocks are largely terrestrial sediments, though marine Pliocene strata are found in some regions. Many beds are rich in fossil remains of the immediate ancestors of the present groups of mammals. The shelly sands and clays of Eastern England were laid down at this time, probably as the sediment of large river estuaries. See **GEOLOGY**.

PLOTINUS, *ploti' nus*. Greek philosopher, leader of the Neoplatonists. He was born in A.D. 205 and studied philosophy at the University of Alexandria. He remained there for eleven years as disciple of Ammonius Saccas, moving after his death to Rome. Here he appears to have lived a saintly life as a priest-philosopher, surrounded by disciples, from discussions with whom grew his work the *Enneads*. Christian, Oriental and Platonic ideas mingle throughout his work. He divides being into the world of sense, which is impermanent, imperfectly knowable and only half partaking of reality, and the world of intelligence, which truly

exists and can be truly known. His attitude to the world of sense comes very near to denying matter: this is because the inherent Hellenic idea of God as transcendent leads to the dilemma of matter as something distinct and separate and therefore almost a limitation of His power. In the intelligible world, Idea, Form and Logos are the works of God; they being life, they are always, as it were, on the point of plunging into material or sensible existence. The divine soul gives off a stream of life, which grows weaker as it flows onwards, becoming instinct rather than reason. Soul becomes Nature and form becomes words, which enter into partnership with matter, creating bodies. The soul, being divine, cannot be contaminated; vice is therefore involuntary: it is the nodding of the soul in sleep.

PLOUGH. The basic tillage implement, slowly improved from the crude forms which are still in use among primitive peoples.

The modern plough, even in its simplest form, is a perfect instrument. For tilling



ROTARY PLOUGH

This plough, invented in England, has two sets of rotating cutters which break up the soil and turn in opposite directions on a vertical axis as the machine goes forward

Photo: P. & A.

a small plot, the *walking* plough is used. This turns but one furrow and can be hauled by a team of horses or a yoke of oxen. Its name refers to the fact that the ploughman walks behind the implement and keeps it in position by grasping the handles. These are attached to the beam, the part by which the plough is drawn. The working part of the implement, which is called the bottom, is made up of the frame, or *frog*, and the mouldboard, the share, and the landside, the last three parts being mounted on the frog.

Wood, steel and iron are the materials used. When the beam is of wood, the frog is usually made of cast iron, a material that

gives the frame strength and rigidity. The mouldboard, share and landside are made either of chilled iron or soft-centre steel. The former material is very hard and durable, but is heavy and subject to fracture if struck suddenly. Ploughs of soft-centre steel are light and cannot be broken easily. They need protection from the weather, however, and in gravelly or sandy soil are not so durable as chilled-iron ploughs.

The purpose of the *mouldboard* is to lift, turn and pulverize the furrow slice. It varies in shape according to the type of soil to be broken. The *sod* mouldboard is long and

strain, but it helps to steady the motion of the plough. *Coulters* and *shimmers* are cutting attachments commonly used to ensure a clean-cut furrow. They are attached to the beam and cut the sward ahead of the share. The coulter is a knife or blade of varying form. The shim coulter is a small shovel-like plough. It is almost indispensable on stubborn sod land.

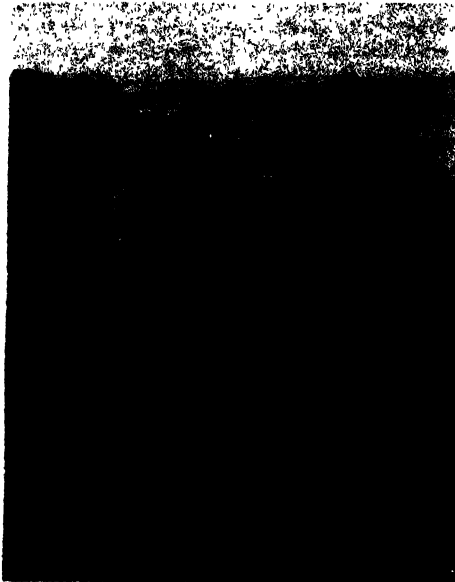
A new type of machine for breaking up the soil and setting it in furrows is the gyrotiller or rotary-plough, which is especially useful in breaking pasture land and mixing the turf with the soil in one operation.

Riding or *sulky* ploughs are in general use in Canada. Some of these ploughs have two, three, or four mouldboards. Ploughs turning more than two furrows require proportionately more power, and motor or oil tractors or traction engines are used to operate them. Gang ploughs turning fifty-four furrows are now in use on some of the largest Canadian wheat farms. It requires three traction engines to operate one of these gangs, and it will plough an acre in a few minutes.

All of the ploughs referred to above are of the mouldboard type. An implement of wholly different construction is the *disk* plough, in which the furrow is turned by a rolling concave blade 2 ft. or more in diameter. The disk plough cuts a furrow 8 to 12 in. wide, and is especially useful for ploughing hard or sticky soil or stony land.

PLOVER, *pluv' er*. Name given a number of related birds which are found in most parts of the world. They frequent mainly moorland and coast, where they congregate to feed on small crustacea, molluscs, insects, and worms. Their long straight bills, with sensitive, bulbous tip, and comparatively long legs are adaptations to their method of feeding and the nature of their environment.

There are several species found in Britain,



WELL-PLOUGHED FURROWS
Photo: Photopress

gently sloping, and has a good deal of a twist. The *stubble* type is short and steep, and has a very abrupt curvature. It is used on land requiring a considerable degree of fining or pulverizing. The *general-purpose* type, intermediate between the other two, is used on farms where there is a light turf to break, but little virgin land. For stiff virgin soil, the best type is the *breaker* mouldboard, which is very long and has a gradual curvature. There are variations of all these types.

The *share* is the cutting edge of the plough.

The *landside* is a sidepiece opposite the mouldboard, making a V-shaped point with the lower front end of the share. By pressing against the side of the furrow, the landside offsets the side pressure exerted on the mouldboard by the slice. Not only does it ease the



GOLDEN PLOVER
Photo: John Kearton

perhaps the commonest being the *golden plover*, which gets its name from the flecks

of golden-yellow on its plumage. There is a closely related golden plover found in America. Another common British species is the *ringed plover*. It is smaller and is distinguished by its collars of black and white. The *little ringed plover* and *Kentish plover* are also found, but much less commonly.

Plovers are typical examples of birds



RINGED PLOVER

Photo: John Kearton

which go on long migration flights, as in the case of the Pacific golden plover. This bird breeds in Alaska and North-east Siberia and migrates across the entirely open North Pacific Ocean to the Sandwich Islands, a distance of over 2000 miles.

Scientific Names. Plovers belong to the *Charadriidae* family. Golden plover, *Charadrius apricarius*. Ringed plover, *Aegialitis hiaticula*.

PLUM. A widely cultivated hardy fruit with a smooth coat and an unwrinkled stone. The ripe fruits show varying shades of purple, red, green and yellow, and they also have a wide range in size. Plums are eaten fresh, dried and marketed as prunes (which see), tinned, preserved, or made into jams and jelly. They are among the most nutritious of hardy fruits; their percentage of carbohydrates is 20.1, as compared with 9.4 for peaches, 14.1 for pears, and 16.7 for cherries. Winter supplies are imported mainly from the Argentine.

The common European plum, or *Prunus domestica*, is native to Eastern Europe and West-central Asia. Another European-Asian species, *P. insititia*, is called the *Bullace* plum, and is the type from which come the fruits commonly known as *Damsons* (which see). Varieties of plums are commonly propagated by budding on to plants grown from seed. See **GRAFTING**.

Though hardy in Britain, the plum is

liable to be affected by spring frosts, since it blossoms earlier than do apples. It grows best in an open position in deep loam, benefiting from a liberal application of lime in spring; shallow sandy soils are unsuitable. Standard trees often prove very strong growers; bushes, pyramids and half-standards are usually found more suitable for gardens. Plum trees which bear regularly require as a rule less pruning than apples. Plums are unaffected by many of the pests of other fruit trees; the grey aphides, which are sometimes troublesome, may be controlled by a nicotine or paraffin solution. For "silver leaf" there is no certain remedy; affected branches should be cut off and burned without delay.

For dessert purposes, plums should remain on the trees until completely ripe.

PLUMBAGO, *plum bay' go*. Plant genus of considerable variety. Some species, like Thrift (*Armeria*) and Sea-lavender (*Statice*), grow wild on the British coasts. Both have been cultivated for gardens, producing beautiful flowers for the herbaceous border. The flowers are of thin texture and usually grow in panicles, i.e. in loose clusters. *Plumbago larpentae*, a hardy plant, will thrive in rock gardens and in raised borders, if in a sunny position. The hot-house species, of which *P. capensis* is a well-known example, will climb to 10 ft. and can be trained over trellises and walls. The flowers are pale blue. *P. capensis alba* produces a white flower, and other varieties have pink blossoms.

PLUMBAGO. See **GRAPHITE**.

PLUMER OF MESSINES AND BILTON, HERBERT CHARLES ONSLOW PLUMER, 1st VISCOUNT (1857-1932). A distinguished soldier. In 1870 he received a commission in the 65th Foot (now the 1st Yorks and Lincs), then stationed in India. He served as adjutant at El Teb and Tamai in 1884. During the Matabele War in the next year, he raised and commanded a Colonial volunteer force. He fought in the second Boer War and shared in the relief of Mafeking and the occupation of the Western Transvaal, being promoted to Major-General. He subsequently held home commands, acting in 1904 and 1905 as Quartermaster-General. He gave much active assistance to the Boy Scout movement. During the World War he proved one of our ablest commanders, his most famous achievement being the capture of the Messines Ridge. He commanded the British forces in Italy and shared in the final phase on the Western Front. After the War he was raised to the peerage and appointed a Field-Marshal. He acted for some time as Governor of Malta and then as High Commissioner for Palestine.

PLUMMET. This is a weight let down at the end of a cord to sound the depth of water or of excavations, or to regulate work such as measuring, by keeping it *plumb*, or in a straight line. In building a wall, the plummet is constantly used by masons. It usually consists of a line fastened to a narrow board at one end, and at the other end to an egg-shaped piece of lead. The weight of the lead keeps the line straight, giving an accurate measure for maintaining the perpendicular. If used near a range of mountains, the plummet is found to be deflected, the attraction of the mass of mountain drawing the metal weight slightly out of line. The difference caused by this attraction, while slight, would be sufficient to throw a high wall quite out of the perpendicular. It is also stated that on the sea coast the ebb and flow of the tide have direct influence on the plummet. See GRAVITATION.

PLUSH. A pile fabric similar to velvet, but with a longer, softer nap. The nap was formerly always of mohair, the hair of the angora goat, but silk and rayon are now used also. Worsted plush with mohair nap is used in making cloaks, caps, hats and other articles of wearing apparel. Plush with a silk nap is used for men's silk hats, for women's coats, and in upholstery. London and Lyons are particularly noted for the manufacture of plush. See VELVET.

PLUTARCH, *plu' tarch* (about A.D. 46–about 125). A Greek biographer and essayist, author of a series of lives of great men that has become a classic. He was born at Chaeronea in Boeotia, near the homes of Hesiod and Pindar, and was educated at Athens and by travel through Greece, Italy and Egypt. In these countries he apparently had access to numerous libraries and records.

His *Parallel Lives of Illustrious Greeks and Romans*, commonly referred to to-day as *Plutarch's Lives*, were written generally in pairs, one Greek and one Roman, and are famous as models of intimate, living biography. In the Middle Ages they were the inspiration of innumerable tales, romances, poems and treatises, and they were used by Shakespeare and other Elizabethan dramatists. To-day, they are an important source of our knowledge of antiquity.

PLUTO. Ninth planet in distance from the sun; it was discovered in 1930. Its location beyond the orbit of Neptune was predicted as early as 1905 by Percival Lowell, of the Lowell Observatory, Flagstaff, Arizona. He inferred its existence from irregularities in the movements of Neptune. Pluto's period of revolution is 249.17 earth years, and it is thought to have four or five times the earth's mass. Its mean distance from



PLUTARCH
From an old print
Photo: Mansell



PLUTO AND PERSEPHONE
By Bernini
Photo: Mansell

the sun is 3,665,000,000 miles. See PLANET; SOLAR SYSTEM.

PLUTO, also known as **HADES**, **ORCUS**, or **DIS**. In Greek mythology, the ruling deity of the lower world; he was the brother of **Zeus** and **Poseidon**. As the thunderbolt is associated with **Zeus** and the trident with **Poseidon**, so to **Pluto** belongs the helmet of invisibility, the gift of the Cyclopes. His palace was within the earth—a dark and dreary place to which, sooner or later, all mankind came. The god was not really cruel but was very jealous of his power, and since he never yielded to petitions to allow the dead to return to earth, he became an object of detestation to all men. Few temples were erected to him, though all feared him so much that they dared not refuse to worship him. That with all his severity **Pluto** was capable of affection, and longed for it in return, is shown by the story of **Persephone**, whom he carried off to be his queen.

PLUTUS, *plu' tus*. In Greek mythology, the god of wealth. He was the son of **Iasion** and of **Demeter**, goddess of agriculture. Because he bestowed his gift of wealth only on the good and noble, **Zeus** struck him blind so that none should be favoured, but good and bad alike receive riches.

PLYMOUTH. A County Borough and seaport of Devonshire, situated at the mouth of the River **Plym**, with an area of 5711

include soap-making, dyeing and chemical-making, as well as a number of minor industries supplying the local market.

The origin of the town is connected with the Augustinian priory of **Plympton**, around which a small colony soon grew up, chiefly engaged in the fishing industry. Later, the magnificent anchorage assured an increasing prosperity. In the fourteenth century it was the port of the Black Prince, and it is recorded that a fleet of more than 300 vessels set sail in 1346. In the sixteenth century it was a port for the English fleet in its operations against the Spanish Armada, and it was on **Plymouth Hoe** that **Sir Francis Drake** was playing bowls when the news was brought that the Spanish Armada was approaching. The ruins of the Augustinian Priory at **Plympton**, three miles up the **Plym**, now form part of a modern house. **Mount Batten Castle** is of about the same date as the citadel and is a memorial of the siege of **Plymouth** in 1643. Of the fourteenth-century castle at **Plymouth** only part of the bastion survives, but of the towers built to defend the coast by **Henry VIII** there are several fragments. The priest's house of **St. Andrew** is the oldest building in the town, and was built to accommodate the canons of **Plympton Priory**. A number of old houses remain. In particular, one or two Elizabethan mansions in **New Street**. **Mayflower House** is associated with the Pilgrim Fathers. At **Minerva House** in **Looe Street**, **Drake's** captains were wont to foregather.

Plymouth is the see of a Roman Catholic bishopric, and the Roman Catholic cathedral is a fine building in the Modern Gothic style.

PLYMOUTH BRETHREN. The name of a Protestant religious sect, more properly called "The Brethren," which originated in **Dublin** in 1828 with the teaching of an Englishman, **Antony Groves**, a student of **Trinity College**. His theory was that all Christians have, as such, the inherent right to preach the Word and administer the Sacraments, and that thus a visible unity among all Christians can be secured.

John Darby, an ex-barrister in **Dublin** who had seceded from the Church of Ireland, allied himself to the movement, and is considered by many to be the real founder of the sect. An ardent propagandist, he went on tour to disseminate his ideas, and in the course of it visited **Plymouth**, where an Assembly of the Brethren was in existence, formed by **Benjamin Newton**, an English clergyman. It was from this Assembly that the sect derives



PLYMOUTH LIDO AND WALKS
Photo: Frith

acres and a population (1931) of 208,166. With its neighbour **Devonport**, it is one of the most important naval centres in England. The naval dockyards give employment to many thousands; a large trade, both import and export, is carried on through the docks. Further business is provided by the trans-Atlantic liners, for which **Plymouth** is a port of call. Manufacturing industries

a name which its members themselves do not recognize.

In 1848, on the reopening of a dispute which had occurred between Darby and Newton three years before, the body was divided into "Neutrals," or "Open" Brethren, who followed Newton, and "Exclusive" Brethren or Darbyites. At the present time there are several sections of the Brethren, differing among themselves on points of doctrine and discipline.

Their theology is Calvinistic. They repudiate any ordained Ministry in the Church of Christ as usurpation of spiritual priesthood which belongs to all believers. Therefore they consider it one of their first principles to separate themselves from all other denominations. Their chief act of worship is the Lord's Supper, which is held weekly and is compulsory to all members. Baptism is practised by immersion, mostly of adults, though some of the Assemblies use Infant Baptism. Their mode of life is strict and on Puritan lines, and evil livers, and those who hold what are judged to be erroneous doctrines, are liable to condemnation and expulsion.

PLYWOOD. The material known as plywood consists of thin boards or sheets made by cementing or gluing under pressure a number of veneers or "plies" of wood, the grain of adjacent plies being at right angles to one another. Usually the number of plies is three, or five for thicker boards, and both hard and soft woods are used, such as oak, mahogany, walnut, birch, alder and Oregon pine. Plywood has the advantage over ordinary boards in being very light and strong, easily cut and with less liability to warp or split; consequently it finds an ever-increasing use as panelling for walls and ceilings, in furniture and box manufacture and aeroplane construction. In the manufacture of plywood, the logs of wood are steamed before cutting to render them pliable and less liable to break; generally the log is rotated against a fixed cutting blade, so that a continuous veneer or ply-sheet is obtained.

PNEUMATICS, *nū mat' iks*. That branch of physics which treats of the properties of gases, either at rest or in motion. See GAS.

PNEUMATIC TOOLS. Implements used in industry which are operated by compressed air (which see). Pneumatic tools are of two classes—those which operate by striking, and those which rotate. In the striking class are included hammers, riveting, caulking, chipping, and rock-drilling tools. Drills and boring tools belong to the rotating class. See BORING MACHINES.

Probably the most efficient of all pneumatic tools is the hammer, with a piston in

the handle working with a backward and forward motion. The power is supplied by compressed air through a flexible hose which allows the tool to be worked at any required angle. With such a hammer it is possible to deliver up to 20,000 blows per minute; it is used in the processes of riveting the steel work in modern buildings. The compressed air usually has a pressure of from 50 to 215 lb. per sq. in., and is controlled by a valve in the handle of the tool. The pneumatic drill, which works on the same principle as the hammer, is the tool most commonly seen.

PNEUMATIC TUBES. A method of sending letters and parcels through tubes, either underground or above, by means of air pressure. In 1667 this method was suggested at a meeting of the Royal Society of London; a device was described by which a cylindrical metal carrier could be sent through tubes by means of suction. Improvements on this suggestion, which were not commercially adopted until 1853, have led to the development of various forms of pneumatic transport devices.

The necessary apparatus consists of a series of tubes, an air compressor, and airtight cylindrical carrying cases. The first pneumatic dispatch tubes installed allowed the carriers to be sent only in one direction, and to but one destination. This was improved upon by the use of alternate suction and pressure, which allowed the carriers to travel both ways. This form was further modified by circular systems, in which a current of air is kept continually moving; the carriers can be withdrawn from the tubes at regular intervals or stations.

Warehouses and large retail stores employ the principle in tubes for conveying money from the counters to the cashier's desk, and in many modern offices papers, letters, etc., are so conveyed from one department or floor to another.

PNEUMATIC TYRES. The invention of a tyre that lessened jolting, gave greater ease in running, and reduced the weight of the machine, was the greatest single factor in popularizing the bicycle in the second half of the nineteenth century, and its later application to the motor-car and the motorcycle made possible the great expansion of the motor industry. The tyre that brought about these results is called pneumatic because it is filled with compressed air (the name coming to us from Greek *pneuma*, wind). As early as 1845, a patent for a pneumatic tyre was taken out in England.

Manufacture. A pneumatic tyre has two parts: an inner tube of thin rubber which is airtight, and an outer cover or case consisting of layers of strong fabric, each cord



PNEUMATIC TYRE MAKING

1. To masticate the rubber, it is passed between heated rollers and over the conveyor seen in the background, where it is cooled; the process is then repeated. Mastication renders it plastic and ready for the mixing process. 2. One of the refining processes is to force the rubber through gauze having 2500 orifices per square inch. The operator is testing the temperature of the rubber as it emerges. 3. Building motor cycle tyres on a flat former. The operator has reached the stage of adding the tread and wall rubber which, it will be seen, is provided in one profiled strip. 4. In this mixing machine the various drugs and chemicals are mixed in the rubber, a very high degree of dispersion being obtained. 5. Building tyre casings on a shaped former. 6. Double press used for the vulcanizing of car tyres.

Photos: Dunlop Rubber Co.

embedded in rubber, with an outer covering of tough abrasion-resisting rubber. See RUBBER AND RUBBER MANUFACTURE.

An ordinary pneumatic tyre consists of the bead, which is a wire cable inserted in the portion next to the rim to hold the tyre on the wheel; casing, composed of several plies of cord fabric, protected from each other by thin coats of rubber; a cushion and breaker strip between the casing and the tread; and the tread itself, the thick patterned surface which comes in contact with the road. In building a tyre, the plies of fabric are built on a "former" which is the size and shape of the inside of the tyre. The fabric is rolled smooth, the bead is put on, the wall rubber, breaker strip, and tread are added, and the tyre is then vulcanized, or cured by heat and pressure, so that all of its parts are united. In some processes, the former is replaced by an air bag of identical size and shape.

In the preparation of the rubber material, anti-oxidants are added which tend to retard oxidation, assist heat-conductivity, and thereby lengthen the useful life of the rubber.

PNOM-PENH, *p'nom' pen' y'*. Capital of Cambodia. See FRENCH INDO-CHINA.

PO, RIVER. A river of Italy, the largest in the kingdom. By its agency the alluvial plain of Lombardy has been built up. From its source in Monte Viso, in the Cottian Alps, it takes an easterly direction for about 420 miles, receiving the Ticino, the Adda, the Mincio, the Panaro, and numerous other streams, and discharging through a large delta into the Adriatic Sea. The Po carries considerable internal commerce.

In spite of artificial embankments, the flow of which were built by the Etruscans about 300 B.C., disastrous floods repeatedly occur, for the river brings down great quantities of silt from the mountains, which raise the level of its bed. The continual rise in the level of the water, with a corresponding elevation in the embankments, has brought the river at Ferrara to the level of the housetops.

POACHING. The unlawful taking of game. In law, a person who without permission enters another's land to kill game or to collect game (even birds which he has shot flying over his own land), or who sends a dog into or even fires a gun across another's land is a trespasser and liable to a civil action. It must be noted that a public right of access to land does not include the right to take game from the land; to use a high-

way for shooting game, or for any purpose other than mere passage and acts incidental thereto, is a trespass to the highway. There are also numerous and detailed provisions of the criminal law dealing with various poaching offences, from entry on land in the daytime in pursuit of game (fine of £2 and costs) to the entry by night of three or more persons, of whom any one has a gun or other weapon (14 years' penal servitude); generally speaking, the offence is increased if committed at night, or by a band of persons,



BATTERY OF TUBE MOULDS

Tubes, like covers, are moulded and hence are seamless and of even thickness throughout.

Photo: Dunlop Rubber Co

or with weapons. See GAME; also TRESPASS.

POCHARD, *poch' ard*. Strictly, this name belongs to the male of a species of duck, the female of which is known as the Dunbird. The characteristic colours of the pochard are red head and neck, black breast, and grey wings. The female or dunbird is a more general brown in colour and less conspicuous.

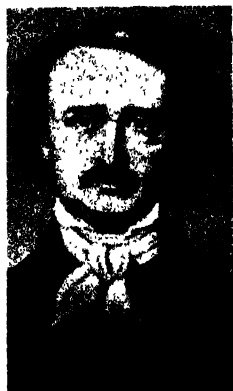
Pochards are typically winter visitors to Britain, where they can be seen in plenty on most inland waters. Sometimes they remain to breed in the south, but more commonly they migrate northwards for the summer months.

Scientific Names. The pochard belongs to the family *Anatidae*. The British variety is *Nyroca ferina*.

PODESTA. See ITALY (Recent History). **POE**, EDGAR ALLAN (1809-1849). An American poet and story-writer whose work, though limited in quantity and scope, bears the mark of an original and romantic imagination. Poe was born in Boston on 19th January, 1809. Left an orphan at two years of age, Poe was adopted by Mr. Allan, a

wealthy merchant of Virginia. His education began at five years in an English school, and was completed in America. In 1827 he published his first volume of poems, and, in desperate need of money, enlisted in the regular army. After serving two years he was honourably discharged through the intervention of Mr. Allan, who also obtained his entrance to West Point Military Academy. But Poe's deliberate unruliness there, followed by court-martial and dismissal within six months, turned his adopted parent irrevocably against him.

In 1833, while living with his aunt, he won a one-hundred dollar prize for the tale *A Manuscript Found in a Bottle*. This success brought him friends, and soon after his marriage with his young cousin, Virginia Clemm, he became connected with a Richmond (Virginia) periodical. He worked tirelessly, and made this the most pleasant and fruitful period of his life. Soon, however, he was set adrift, to serve briefly but brilliantly with *The Gentleman's Magazine*, *Graham's*



EDGAR ALLAN POE
Photo Brown Bros

Magazine, and several others, but always with the same result—dismissal for unjust criticisms in his articles or for irregularity due to intemperance. The strain of the long illness and death in 1847 of his wife prostrated Poe, who never recovered his former vigour. Although never dissipated for long periods, he drank more and more frequently. On 7th October, 1849, he died from his excesses.

Poe's work was of three kinds—critical, poetical and narrative. He was in many ways a brilliant critic, but he was an artist greater than those he criticized, and he judged harshly when the work before him did not appeal to him. His bitter criticisms of Longfellow arose from his own conception of the essence of poetry. Poe defined poetry as music, and if this be accepted, some of his own poems are unrivalled. *The Raven*, *The Bells*, *Annabel Lee*, and *Ulalume* show great power. His work, introduced into France by Baudelaire, had a powerful influence on nineteenth-century French poetry.

Though Poe's greatest fame rests on his poems, he is best known in England for his tales *Ligeia*, *William Wilson*, *The Gold Bug*,

The Purloined Letter, *The Fall of the House of Usher*, and others. Horror, ingenuity and action he handled with consummate skill, and if he had little power of character-drawing, his detective, Dupin, was the parent of a host of such characters in fiction. A great part of his work, in which his peculiar genius expresses itself, is not likely to be forgotten.

POET LAUREATE. A title conferred by the Crown upon certain English poets. Among the ancient Greeks it was customary to crown with a wreath a poet who was successful in a contest, and from the laurel of which the wreath was composed has come the word *laureate*. Originally, the poet laureate had as a specific duty the writing of odes on important national occasions, but in late years this task has by no means been rigidly required. Tennyson, however, wrote a number of his best-known poems for State occasions. The laureate is by tradition a member of the Royal household, the sum received by him has varied at different times, some of the earlier appointees having received as much as £300 a year. The "sack," or canary wine, granted originally to Ben Jonson, was commuted by Henry James Pye and his successors to a payment in money. Ben Jonson was the first poet formally appointed laureate by the Crown, but poets before his time, e.g. Spenser and Daniel, performed the duties in practice. Following is a list of holders of the honour by letters patent—

NAME	BORN	APPOINTED	DIED
Ben Jonson	1573	1619	1637
Sir William Davenant	1606	1638	1668
John Dryden	1631	1670	1700
Thomas Shadwell	1642	1688	1692
Nahum Tate	1652	1692	1715
Nicholas Rowe	1674	1715	1718
Rev. Laurence Eusden	1688	1718	1730
Colley Cibber	1671	1730	1757
William Whitehead	1715	1758	1785
Thomas Warton	1728	1785	1790
Henry James Pye	1745	1790	1813
Robert Southey	1774	1813	1843
William Wordsworth	1770	1843	1850
Alfred, Lord Tennyson	1800	1850	1892
Alfred Austin	1835	1866	1913
Robert Bridges	1844	1913	1930
John Masefield	1875	1930	—

POETRY. Whatever poetry is, it is not simply verse. Verse is metrical language, which may be poetry or may be "rime doggerel." And while metrical language is often the vehicle of poetry, it is not invariably or essentially so.

Poets have philosophized throughout the ages on the nature of poetry, and sometimes their practice has been in accordance with their philosophy. In a lecture on *The Name and Nature of Poetry* (1933), Prof. A. E. Housman remarks, "Poetry is not the thing said, but a way of saying it." The results

of philosophical inquiries into the nature of poetry can perhaps be divided into three classes: (1) Poetry is "the thing said." (2) Poetry is "the way of saying it." (3) Poetry is the thing said *and* the way of saying it.

(1) The most famous exponents of the first class are Philip Sidney, Wordsworth, Shelley, Matthew Arnold, and indeed all the romantic poets who have ever lived. Sidney, in his *Apologie for Poetrie*, defines poetry as "an art of imitation . . . a speaking picture, with this end, to teach and delight"; and its function is to imitate "nothing of what is, hath been, or shall be; but range only, reined with learned discretion, into a divine consideration of what may be and should be." Shelley, whose philosophy of poetry is an account of his own poetical ideals and practice, believed that poetry is an expression of an artist's longing for perfection. Truth, beauty, and goodness are but different aspects of perfection. The poet's language is harmonious and rhythmical because the meaning he expresses is a harmony and rhythm. But it need not be metrical; for neither Shelley nor Wordsworth believed that metre is essential to poetry.

Shelley and Sidney were above all else concerned with the poet as a moral force and with poetry as his instrument. But neither of them was didactic. Shelley hated didacticism because deliberate moral instruction is a direct appeal to the reasoning intellect, and is therefore an intellectual process, of which the proper vehicle is prose. The moral effect of poetry, he believed, is produced through imagination and not through instruction. Imagination is, for Shelley, "the greatest instrument of moral good." Poetry is a moral force because it exercises the reader's imagination, filling it with beautiful impersonations of all that we would wish to be.

But Shelley, like all the other romantic poets except perhaps Keats, underestimated the importance of expression in his enthusiasm for the substance of poetry. He believed perfect expression to be impossible and therefore did not strive after it. Keats, in fact, was right in telling him that he might be more of an artist. Similarly, Wordsworth tried to erect his indifference for expression into a poetical philosophy in his famous preface to the *Lyrical Ballads*.

(2) The most famous advocates, in their critical utterances and in their poetry, of the importance of expression—"the way of saying it" as distinct from "the thing said"—are Dryden and Pope, and all the classical poets who have ever lived. The eighteenth-century poets believed that they had discovered the perfect medium of expression,

that their language was "refined" as it had never been before. But Housman, who belonged to an age which realized that language is not and can never be static until it is dead, describes the "correct and splendid diction" of eighteenth-century poets as "a thick, stiff, unaccommodating medium" interposed between the writer and his work. He will not recognize that language and technique have any set standard of perfection, but declares that their perfection must be measured by the success with which they carry out the supreme function of poetry, which is "to transfuse emotion." He quotes the song of Shakespeare's beginning "Take, O take those lips away," which, he says, "is nonsense; but it is ravishing poetry." In other words, the song may appear to say nothing sensible to the conscious reasoning intellect, but the words of which it is composed create an image of beauty in the reader's imagination and stir his emotions.

(3) Without realizing it, Housman was repressing the belief of modern poets that poetry is both the thing said and the way of saying it. Shakespeare's song shows the two in complete fusion: the image of beauty is indistinguishable from the beauty of the words which create it. T. S. Eliot, in the *Introduction* to his edition of Ezra Pound's poetry, declares that a distinction must be drawn between the form and the substance of poetry, that is, between the poet's technique and the poet's experience. "A poet's work may proceed along two lines on an imaginary graph; one of the lines being his conscious and continuous effort in technical excellence, that is, in continually developing his medium for the moment when he really has something to say. The other line is just his normal human course of development, his accumulation and digestion of experience. Now and then the two lines may converge at a high peak, so that we get a masterpiece."

Chaucer's *Troilus and Criseyde* or Shakespeare's *Macbeth* is such a masterpiece. One cannot read and appreciate Chaucer's poetry without being convinced that he set himself an artistic ideal; and Chaucer himself refers, half humorously, half seriously, to

"The life so short, the craft so long to learn."

Again, the old legend of a Shakespeare who wrote his plays without a blot is giving way to the new and probably truer conception of a Shakespeare who was a conscious and deliberate artist.

Truth, beauty, and goodness are the inspiration and substance of poetry; but they are meaningless to anyone but their possessor unless he gives them adequate

expression. Great poetry may therefore be re-defined as the perfect expression of an artist's longing for perfection.

The Difference Between Poetry and Prose. Poetry is essentially emotional, prose is essentially intellectual and unemotional. But there is no sharp dividing line between prose and poetry. "They are different realms but between them lies a debatable land which a De Quincey or Walt Whitman may attempt."

POINCARÉ, *pwaN kah reh'*, RAYMOND (1860-1934). President of France from 1913 to 1920, a leader of the Republic during the

World War, and four times Premier of France. Throughout his long public career he was known as a man of great ability, tireless energy and intense patriotism.

Born at Bar-le-Duc, Lorraine, he was educated for the law and was highly successful in practice in Paris. He gained a comfortable fortune and founded his subsequent career on the firm basis of financial independence.

His first public office was that of a member of the Chamber of Deputies, to which he was elected at the age of 27. In 1893 he became Minister of Public Instruction. The following year he was made Finance Minister, and in this post he gained a high reputation. When, in 1912, he became Premier and Foreign Minister, he devoted his efforts to strengthening the Triple Entente, the friendly alliance of France, Russia and England.

Poincaré's election to the Presidency, in 1913, occasioned the utmost enthusiasm in the Republic. On the outbreak of the World War, it was seen that this confidence was not misplaced. He stimulated his Ministers to great activity, and raised the country to a high pitch of patriotism. When things went badly for France and the Allies, and Paris was in danger of capture, Poincaré showed a calm resolution, a capacity for endurance, and a relentlessness of purpose that could not be shaken. His firmness and courage were undisputable factors in the final victory.

After completing his term as President, he was elected to the Senate in 1920. The great question before the French people at this time was the collection of war reparations

from Germany. Poincaré believed that the full and prompt payment of the indemnity was necessary for the self-preservation of France, and he advocated the enforcement of the French claims, even though it meant the occupation of German territory.

This belief entirely coincided with the views of the French people, and Poincaré was again made Premier in 1922 and proceeded to carry out his reparations policy, which led to the occupation of the Ruhr in 1923. He remained in power until 1924, when a financial crisis brought about his defeat.

The desperate struggle to balance the Budget and stabilize the franc proved in vain, however, and Poincaré was recalled to the Premiership with a strong coalition Cabinet. He took over the Ministry of Finance and introduced at once a bold policy of retrenchment and economy. Under his able management, the franc made a notable recovery and the Budget was balanced for the first time since the war.

In November, 1928, the Poincaré Cabinet fell, but within a week Poincaré was again called upon to become Premier of France. He served until the ratification of the American debt-funding plan by the Chamber of Deputies and French Senate in July, 1929, when he resigned on account of ill health.

He was honoured by election to the French Academy, and in 1914 was made Lord Rector of Glasgow University. In addition to many articles in magazines and newspapers, Poincaré published several books, among them *L'Europe sous les Armes*, *Histoire Politique*, *Mémoires*, *L'Invasion*.

POINSETTIA. A tropical plant, native to Mexico and parts of South America. The red foliage is extremely decorative. The leaves are green and lance-shaped; what appear to be red leaves are in reality bracts, and in the centre of the scarlet foliage clusters are the yellow flowers.

In England and generally, except in very warm climates, the poinsettia can only be grown in the greenhouse.

Scientific Names. The poinsettia belongs to the spurge family, *Euphorbiaceae*. The variety described is *Euphorbia pulcherrima*.

POINTER. The pointer seems to have reached England from Spain early in the eighteenth century. He became very popular with sportsmen, but at the present time is not so extensively used, except in those parts of the country where geographical formation does not lend itself to driving the birds over the guns. He is a particularly keen, clever worker, with a natural instinct for pointing game.

The chief characteristic of the breed is its concentration on scent. He is a keen, sleek, symmetrical-looking dog, powerful, with



POINCARÉ.
Photo Brown Bros.

long muscular neck; slightly arched, straight, strong forelegs; the large eyes full of animation and intelligence; ears thin, silky and of medium length, hanging flat on the cheeks; a well-developed and powerful body. The finely pointed tail is carried just about level with the back. He must have long, muscular and well-developed thighs if he is to have the desired speed and endurance. In the early part of the nineteenth century, sports-



POINTER
Photo. U. & U.

men crossed their pointers with foxhounds to achieve greater speed.

A big pointer stands about 24 in. at the shoulder, and weighs about 60 lb.

As to colour, a predominance of white has been thought the best, because it assists the sportsman in detecting the whereabouts of his dogs in high cover; the colour of the markings on this white ground is of no importance, but any tricolour (that is, white ground with markings of two colours) is unsatisfactory.

POISON. The term *poison* is a relative one, as so much depends on the quantity taken and the condition of the person taking it. Nearly all drugs, for example, are poisonous in excessive doses.

Poisons may be grouped under three headings: (1) Food poisons, (2) Domestic poisons, (3) Drugs.

Food Poisons. Food is now rarely contaminated. Arsenic has once or twice found its way into beer, and antimony into lemonade. Both are violent irritants, causing vomiting and prostration. Lead, which may get into soft water or cider, is a cumulative poison. Aluminium has been criticized as a material for kitchenware, but its occasional bad effects, like those of eggs and fish, are no doubt due to personal idiosyncrasies.

Food poisoning is, in reality, most frequently caused by living organisms. The *Salmonella* group of bacteria, which some-

times occurs in manipulated foods, causes diarrhoea, vomiting and collapse, but rarely brings about a fatal result.

Botulism is more rare, though unfortunately the mortality rate is over 60 per cent. In this disease, the central nervous system is involved; vision becomes blurred, the gait staggering, and swallowing and speech are paralysed. It is caused by a toxin from a specific organism, *B. botulinus*, which is produced only under rigidly defined conditions. Antitoxin is available, but, for success, has to be injected before the toxin reaches the nervous system.

P'tomaines are putrefaction products of meat. They are certainly poisonous, but as no sane person would dream of touching food so obviously tainted, poisoning therefrom is largely a popular myth.

Domestic Poisons. Strong acids and alkalies, including salts of lemon (oxalic acid) and disinfectants, are in common use in the home, and these, if taken, cause disintegration of the gut, with distressing symptoms better left to the imagination.

The lethal action of domestic gas is due mainly to carbon monoxide, which, when inhaled, rapidly displaces oxygen from the blood, the victim losing consciousness and quickly dying from lack of oxygen, unless vigorous artificial respiration is applied.

Drugs present the largest group of poisons.

Chloroform, whether inhaled or taken internally, in excess produces heart and respiratory failure. All the hypnotics, or sleep producers, e.g. veronal, are dangerous, while morphine, in toxic doses, produces deep coma and death from depression of heart and lungs. Heroin (diacetylmorphine) is even more potent. Atropine, from deadly nightshade (*belladonna*), produces excitement and delirium before the onset of coma, and the related scopolamine (hyoscyne) from *Datura* is similar, but not so exciting.

The drugs mentioned above are all similar in that they produce intervening unconsciousness in toxic doses.

Strychnine, however, affords no such intervening period, and is perhaps the most terrible of all plant poisons. It acts as a direct stimulant to both the motor and sense nerve endings, producing violent convulsions and death from asphyxia, during spasm of the diaphragm. Curare, the Indian arrow poison, is related to strychnine botanically. It produces paralysis, but no convulsions, and has been used to counteract the symptoms of tetanus (lockjaw) and of strychnine itself.

Conine, from common hemlock, has little use of a drug, but is noteworthy as being the poison used by Socrates, who, while dying,

described accurately the creeping paralysis it causes.

Aconitine, from aconite, is perhaps the most poisonous of all plant products, being



POISON GAS IN NATURE

From the Sissa Crater in the Great Rift Valley of Central Africa. Poison fumes issue forth.

Photo: Cherry Kearton

known to cause death in doses of $\frac{1}{10}$ grain. It paralyzes the sense nerves (tingling and numbness) and the heart itself in a very short time. It is sometimes used externally in minute doses for neuralgia, etc.

Prussic acid and its salts (cyanides) are rarely used as drugs on account of their toxicity. They combine with the blood, and paralyze the brain and heart with alarming effects, the victim falling down unconscious within a few seconds, and dying of asphyxia and heart failure.

First-aid treatment in poisoning cases usually involves clearing out the stomach, at all costs. Vomiting should be induced, and the stomach washed out by inserting a stomach tube, $\frac{1}{4}$ in. gas tubing, 5 ft., will do, and syphoning repeatedly with water. Medical aid should be sought immediately.

POISON GAS. Vapours generated in volcanic regions of the earth; and gases produced artificially as lethal weapons. As a weapon of aggression, gas was first used in modern times in April, 1915, at Ypres. The ancient Greeks, however, are said to have used poisonous fumes in war. The possibilities of chemical warfare were considered by the nations at the international conference on limitation of armaments held at Washington in 1921, and by 1929, nine nations—Germany, Poland,

France, Belgium, Italy, Russia, Austria, Venezuela, and Egypt—had agreed to accept the protocol of the League of Nations against the use of poison gas in warfare. Also in 1929 Great Britain announced her intention to accept the protocol. Italy's conquest of Ethiopia in 1935-6, however, was aided by the extensive use of this weapon, in disregard of the treaty.

The various compounds used have different effects. Some cause irritation of the throat and nose; some burn the skin; some produce temporary blindness by causing excessive flow of tears. There are sneezing gases, asphyxiating gases, gases causing paralysis of the nerves, gases that burn, and gases that cause death by affecting heart action. Most of the poisonous compounds contain chlorine (which see).

As to methods of dissemination, the gases are liberated from containers and then carried by wind currents, or are enclosed in explosive shells and hurled against the enemy by ordinary bombardment or

in bombs dropped from aeroplanes. Various types of masks have been devised as a protection against gas attacks. These usually contain neutralizing chemicals, or absorbent substances like charcoal and soda-lime, to nullify the effects of the gases. See



BLOW-HOLE IN CENTRAL AFRICA

The gas given off from this blow-hole is so poisonous that animals which feed near to it drop dead.

Photo: Cherry Kearton

also FUMIGATION See illustration on next page.

POISONOUS PLANTS. Plants which are injurious in their effects, either when touched

or when eaten. No sharp distinction can be drawn between poisonous and non-poisonous species. The poisonous principle is found in seeds, foliage, fruit, roots or tubers, and sometimes in one part and not in another; e.g. the stalks of common rhubarb



GAS MASKS
Factory testing room.
Photo: Photopress

are wholesome, but the leaves in quantity are poisonous. The tropical cassava (manioc)—the source of tapioca and of arrowroot—is poisonous until the acrid juice pervading it is dried out by exposure to the sun.

Many standard medicines are prepared from plants generally regarded as poisonous. Poison ivy and poison sumac are among the most common of those plants poisonous when touched, though not all persons are affected by them. Belladonna, or deadly nightshade, is a flowering herb poisonous in all parts, but valued for medicinal purposes. The mushroom group includes both edible and poisonous species. See BELLADONNA; MUSHROOMS, etc.

Some of the commoner British plants which are poisonous are: foxgloves, wood sorrel, hellebore, monkshood (aconite), fool's parsley, the spurge, autumn crocus (meadow saffron), yew and box, laburnum and privet.

POITERS, *pwah' tyeh*, **BATTLE OF**. The second great victory of the English in the Hundred Years War, fought in 1356. See EDWARD THE BLACK PRINCE.

POKER. A card game usually played with the full pack of fifty-two cards, with or without the addition of the joker. Any number from two to seven may take part. The name is derived from the French *poque* mispronounced.

Poker is played for stakes. An "ante" (or minimum stake to be laid down by every player before being dealt a hand) and a

maximum must be fixed. Five cards are then dealt to each player, who has the choice of retaining the hand given him or of drawing any number from one to five from the remainder of the pack, the aim of the game being to form certain card combinations (see below). The player on the left of the dealer next must decide whether he will throw in his hand, in which case he forfeits the ante, or will bet on it. His bet may be any amount up to the maximum stake. The next player on his left (supposing the first has bet a sum less than the maximum) has three choices. He may throw in his hand, equalize the bet, or raise it again to any figure short of the maximum. The game continues in this way until only two hands are left in, or until the betting is equalized all round the table. The first player must then expose his hand, and wins the pool, unless any other player can show a better combination. Obviously, bluff is as important as skill in a game in which the pool often falls to a player who bets high, thus bluffing other players to throw in their hands.

The value of hands has been worked out according to mathematical tables of odds. The highest hand is the *Royal straight flush*, a sequence of five cards in one suit headed by ace; the next highest the *straight flush*, a sequence of any five cards in one suit, this is followed by a hand in which four of a kind are held together, e.g. four aces or four kings. Next comes the *full house*, three of a kind plus two of a kind, the *flush*, five cards of one suit, the *straight*, five cards in sequence but not in the same suit; *three*, three cards of the same denomination; two pairs, and lowest of all, one pair.



KRACOW, THE HABUICAN
Photo Polish Travel Office

POLAND. Since 1918 an independent Republic of Central Europe, lying between Germany and Russia, with Czechoslovakia and Rumania on the south and Lithuania and East Prussia on the north. Covering an area of 139,868 sq. miles, Poland is now

POLAND POLITICAL

English Miles

Kilometers

Scale

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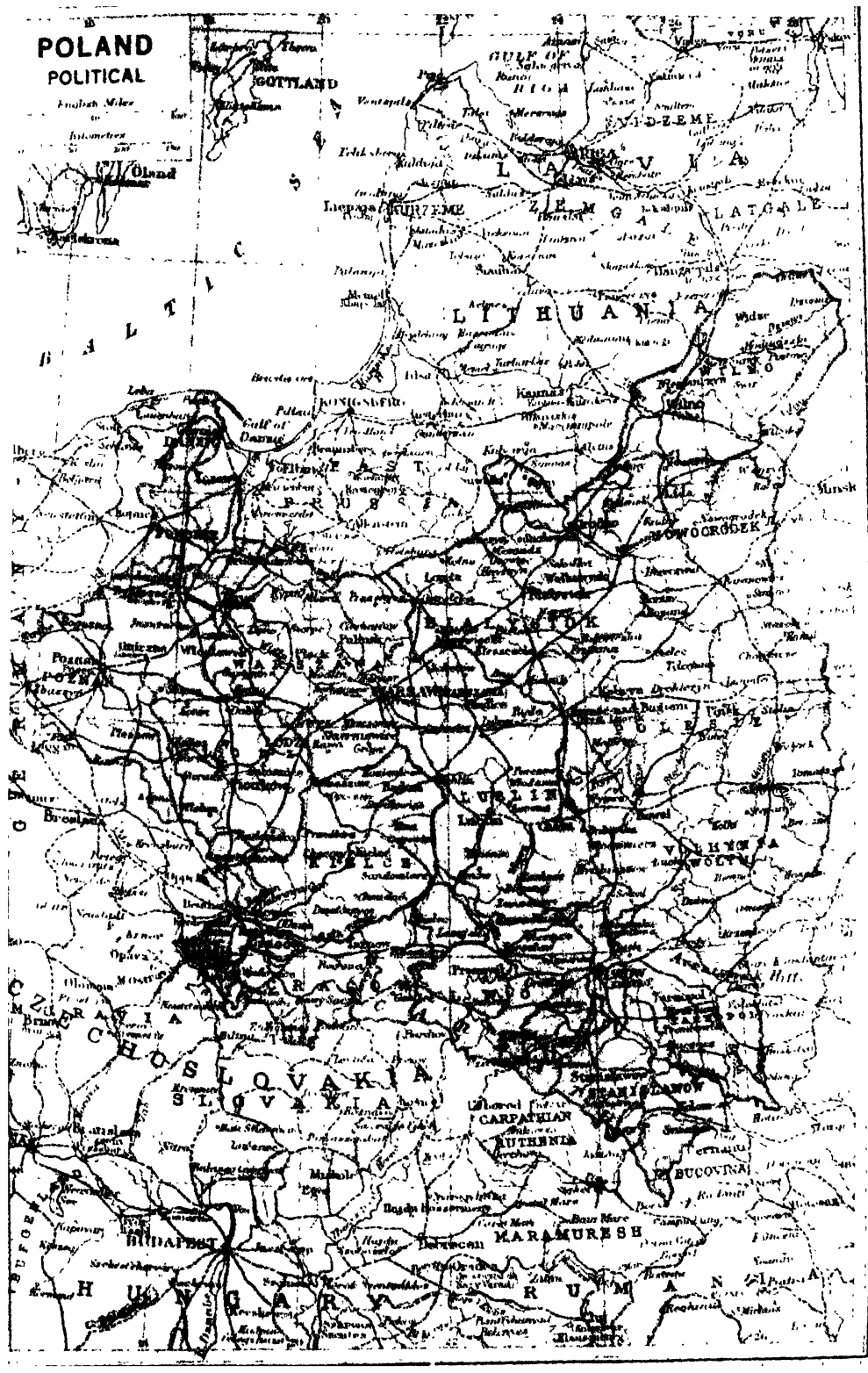
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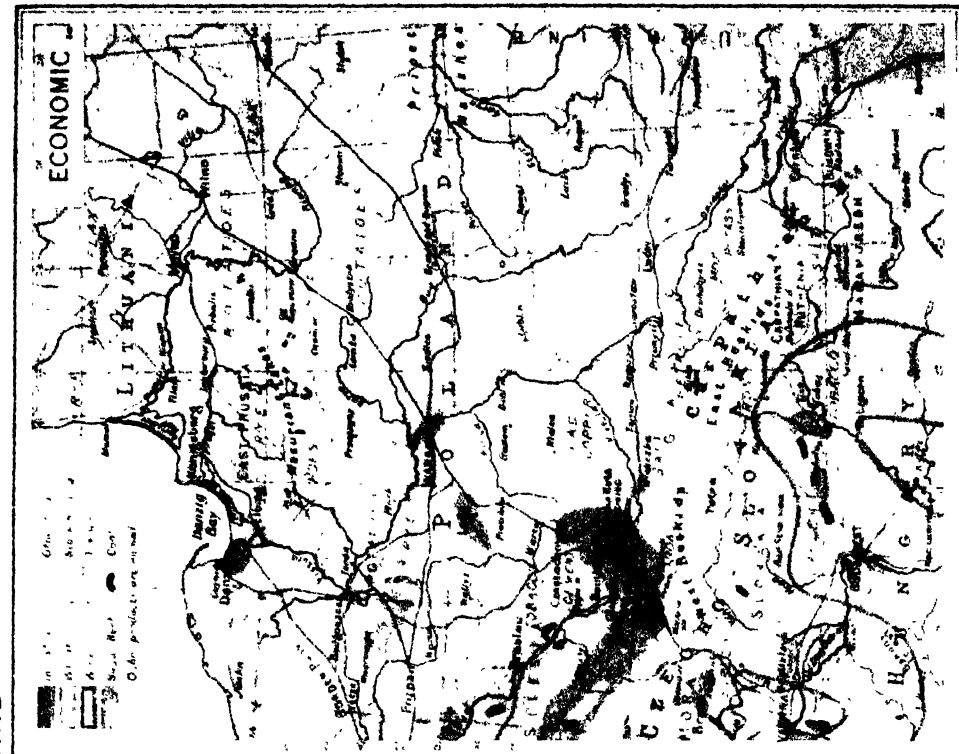
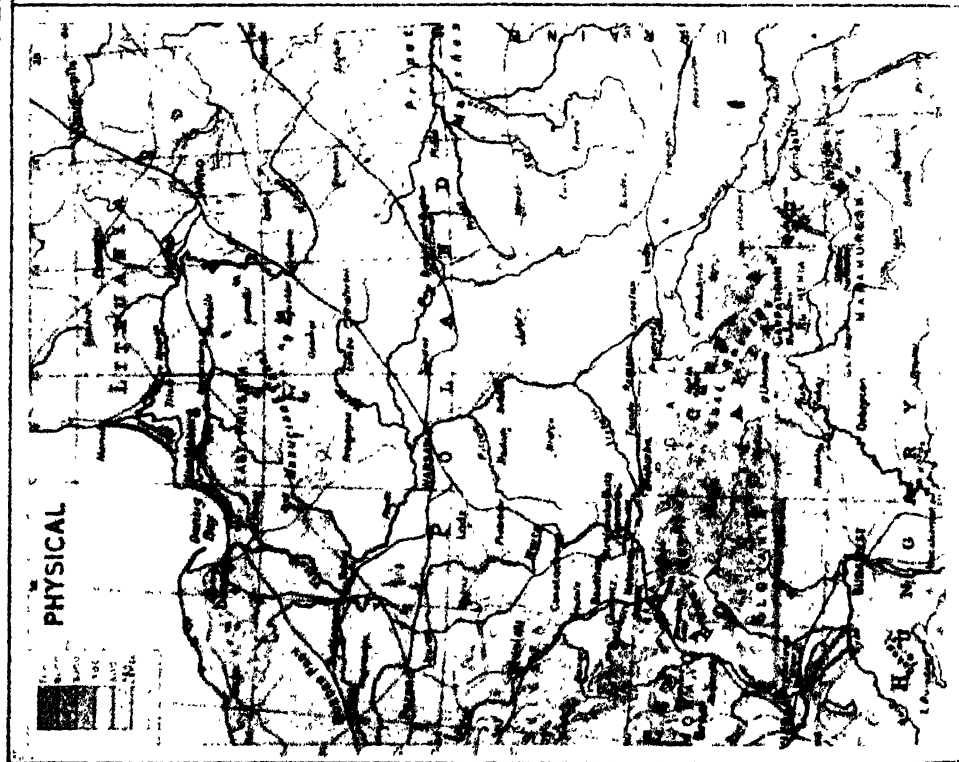
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POLAND

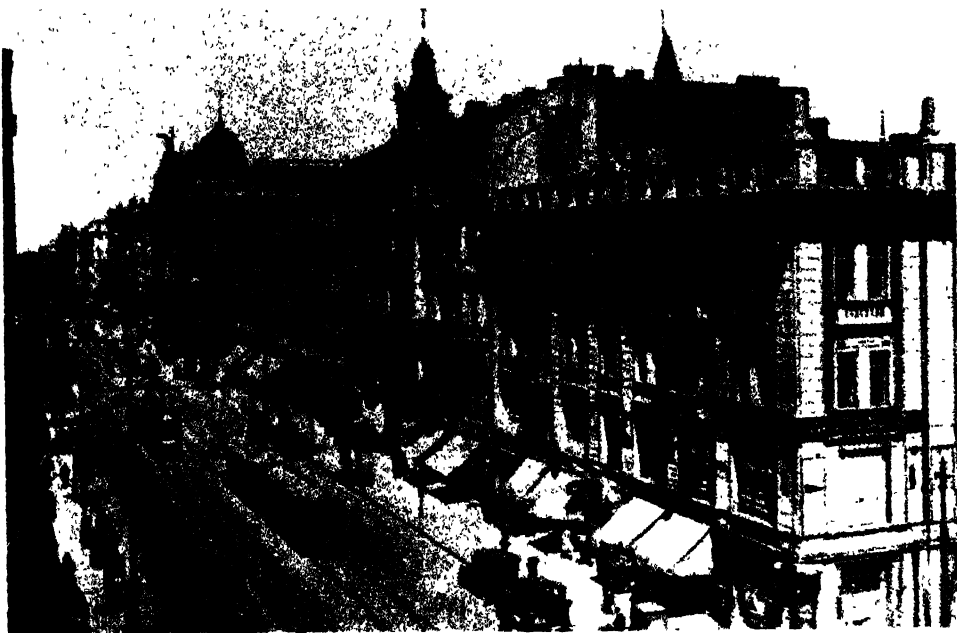


less than half its size at the time of its greatest territorial expansion.

The People. The population of Poland is 33,001,600 (1934); twenty-two million are Poles, the remainder being largely Ukrainians, White Russians, Germans and Jews. The majority of the Poles are Roman Catholic, while the Ukrainians are Greek Catholic; the Jewish population numbers about 9 per cent of the whole, and centres

the capital, is treated in a separate article. The following are the other principal cities and towns—

Cracow, officially *Kracow*, an ancient city, was for centuries the capital of the kingdom of Poland, until superseded by Warsaw in 1610; in the famous Gothic Cathedral of Stanislaus, Polish kings were crowned and buried. Here also are buried many of the national heroes, including John



STREET IN WARSAW
Photo: Polish Travel Office

chiefly in cities of commercial importance. The birth-rate is the highest in Europe. In the second half of the nineteenth century, the density of the rural population was greater than the land could support, and great numbers emigrated, principally to the United States, where the Polish population is 3,342,198 (1930), including those born in America as well as native Poles.

Education, free and compulsory for pupils below the age of 16, is receiving greater attention than formerly. There are eight universities, that of Cracow dating from as early as 1364, and there are several institutions for technical and scientific study, and 205 colleges for teachers.

The Cities. About 27 per cent of the population is urban, and the majority of the people are of the peasant class. Warsaw,

III (Sobieski, Kosciuszko, Pomiatowski, and Mickiewicz. Cracow has long been the intellectual centre of Poland.

Built on the River Vistula, the city has a large trade in timber, grain, cattle and salt. At Wieliczka, within 8 miles of the city, are some of the largest salt-mines in the world. Leather, machinery, textiles and chemicals are manufactured. Its population is 221,260 (1934).

Lemberg, officially *Luow*, is on the River Peltew, 365 miles north-east of Vienna. The site is defended by a citadel, around which the modern town has grown up. There are imposing Greek and Roman Catholic cathedrals and the third oldest university in Poland. In the Ossolinski National Institute are valuable collections of Polish historical and literary relics.

Lemberg was founded in the thirteenth century. Population, 316,177 (1934).

Łódź, situated 87 miles south-west of Warsaw, is an important industrial centre, manufacturing cotton and woollen textiles. Its population of 605,467 (1934) is about 60 per cent Polish and about 40 per cent Jewish.

Posen, or *Poznań*. See Article.

Vilna, officially *Wilno*, a city acquired by Poland in 1923 after disputes with Lithuania (see *History*, below); is 436 miles south-west of Leningrad. It is the historic capital of Lithuania. At one time the seat of Polish and Jewish culture, the city is still an educational centre. The chief manufactures are knitted goods, tobacco, buttons, gloves, artificial flowers, etc., and the principal trade is in timber and grain. The population is 207,000 (1934), consisting mainly of Jews, Lithuanians and Poles.

Physical Features and Climate. The greater part of Poland is a plain of relatively recent

rocks overlain by glacial deposits, but in the south there are more elevated regions and some areas of older rocks. The winters are cold and the summers hot. Rainfall is not great and occurs chiefly in summer. Frost congeals the rivers from December until March, and the harbour of Gdynia is kept open by ice-breakers. Most of the plain was originally forested with deciduous and coniferous trees, but over 70 per cent of it is now cleared. The Vistula is the chief river and the highway of trade: its river plains afford the most fertile parts of the country. Steamers can navigate it to Cracow. The Bromberg canal links it with the Oder, and the canalized Nogat arm with the Königsberg Haff.

Resources and Industries. The state owns

about 30 per cent of the forests, and the trees include Scotch pine, spruce, fir, beech, oak, alder, birch and elm. But the country is essentially agricultural, over half the population being peasant farmers. Since 1925 the size of holdings has been limited, the State taking over the large estates, and redistributing the land among the small farmers. In the industrial area an owner may retain 148 acres; in the border prov-

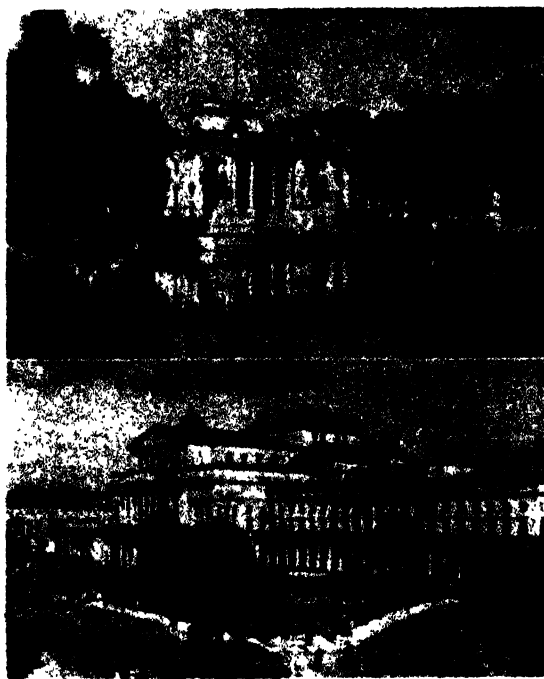
inces, 1000 acres; and elsewhere, 435 acres.

The potato yield is immense, amounting to 30,000,000 tons annually, and forming the main diet of the peasant class, the surplus is used for the distillation of alcohol and the manufacture of starch. The sugar-beet crop is large, and over seventy refineries produce over half a million tons of sugar in a year. Rye, wheat and barley are grown, as well as hemp, hops and flax. Horse-breeding is a progressive industry, and cattle, pigs and poultry are valuable items of export.

Poland obtained valuable mineral resources together with the new territory acquired after the World War. The Upper Silesia area has enough coal to last 300 years with an annual production of 30,000,000 tons. Zinc mines, too, are situated in this territory, and over 90,000 tons are mined annually in Poland. The province of Galicia is rich in petroleum; the production now is rapidly increasing.

Natural gas is produced, and the greater part of current production is controlled by French capital. Poland has an almost inexhaustible supply of salt, and the mines are Government-owned.

Manufactures. In addition to iron and steel products, the manufactures include cotton and woollen textiles. Devastated during the

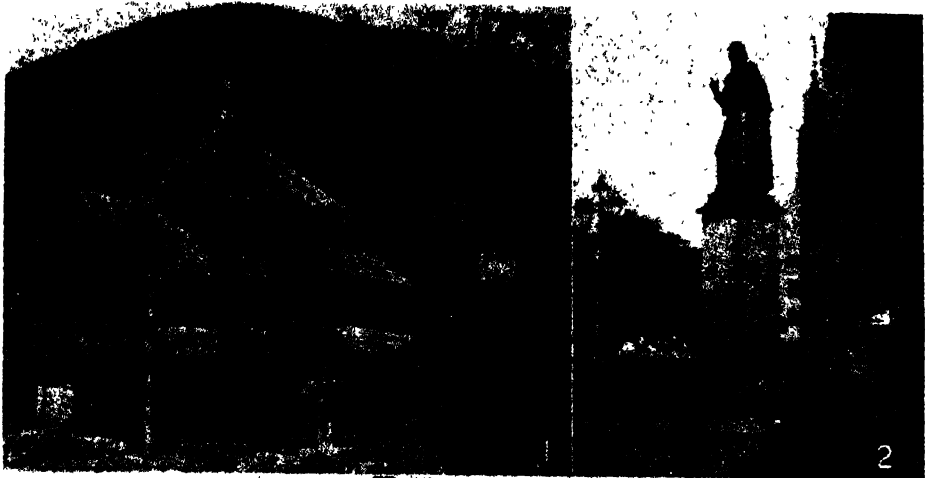


WARSAW

Above: The Royal Palace in Łazienki

Below: The Opera House.

Photos: Polish Travel Office



SCENES IN POLAND

1. Wooden church in the Tatras. 2. Statue of Copernicus in Torun, his birth place. 3. Town Hall, Torun, a Gothic structure dating from the fourteenth century. 4. "Hercules' Club," a rock near Ojców. It is 56 ft. in height. 5. Landscape in Western Poland. 6. Oil fields at Borystaw.

Photos - Polish Travel Office

World War, and with her machinery destroyed and without home sources for her raw materials, Poland suffered a decline of manufacturing prosperity, and the textile industry was forced to seek foreign credit for rebuilding. The production now exceeds the pre-war figure by 40 per cent. Cheap labour is a great help, but is due largely to the over-population in Galicia.

Communications, Commerce. The most urgent railway problem was that of providing for the new directions of trade. Formerly, the main routes led to Leningrad, Vienna and German centres, but when Poland secured an outlet to the sea, railway facilities toward Danzig became necessary, and communication with Upper Silesia was subsequently established. Poland's entire system of railways, of over 12,417 miles, is State-controlled.

The River Vistula leads to the Free City of Danzig. Not satisfied to benefit from a seaport where expansion was blocked, Poland began in 1928 to develop a new port on her own territory, a little east of Danzig.

The village of Gdynia, a fishing port, was chosen as the new Polish maritime centre, and vast port developments were at once inaugurated. Modern Gdynia, which is rapidly expanding, has a population of about 60,000 and is now connected by rail direct with Cracow, as well as with Warsaw via Danzig, exporting coal, sugar and grain and importing chiefly scrap iron. Poland's trade is carried on chiefly with its European neighbours and the United Kingdom. See DANZIG.

Government. The Constitution of 1934 gave the President of Poland the powers of a dictator with the authority to name his successor. Members of the cabinet hold office at the pleasure of the President. He also appoints the commander-in-chief of the army.

A two-chambered parliament was provided for, with a lower house or Sejm and an upper house or Senate. The President, however, has the power to veto any acts of parliament and to dissolve it at any time.

Early History. During the early period of its existence, the country was divided into small communities. In the reign of Mieczyslaw I (962-992), these communities were united into the semblance of a nation. Mieczyslaw was a vassal of the German Emperor, and he renounced paganism for Christianity. During the reign of his successor and son, Boleslaw the Brave (992-1026), Poland became an independent kingdom. Later the country was involved in numerous wars. Germans now began to settle, and took a leading part in developing the industries and municipal institutions. The country was united under Ladislas I (1306-1333), who abolished many abuses and instituted

the Diet, or Legislative Assembly. Under his successor, Casimir III, the Great (1333-1370), Poland increased rapidly in wealth and in power.

Casimir was succeeded by his nephew Louis the Great, King of Hungary, whose daughter Hedwig became queen in 1384. Hedwig married Jagello, Prince of Lithuania, and thus established the Jagellon dynasty, which continued to 1572. During this period Poland attained its highest point in wealth and influence. In 1569 the union of Lithuania to Poland was proclaimed. The kingdom then extended from the Baltic Sea to the Dniester.

The last of the Jagellons died without an heir, and from that time the kings were elected by the Diet, which consisted of two houses—the Senate, composed of the chief nobles, and the Nuncios, or House of Representatives, composed of the inferior barons.

Owing to the jealousies of the nobles, the king was at this time usually chosen from the Royal Family of some other nation. A number of Polish kings, however, were elected, and among the most noted of these was General Sobieski, who became king in 1674 under the title of John III. By his ability as a soldier and statesman, Sobieski preserved Europe from Turkish invasion, defeating the Turkish army under the walls of Vienna in 1683.

Dismemberment of Poland. In 1667 the Ukraine was lost to Russia with the beginning of Russian interference, came the first mark of the decline of Poland. The First Partition in 1772 was deliberately planned by Frederick the Great of Prussia and Catherine II of Russia. Through their influence, Stanislas Poniatowski, a Polish noble, was elected king. His election led to anarchy in Poland, as the enemies of that country had foreseen. This disturbed condition gave Frederick and Catherine an excuse for intervention, which resulted in the appropriation of a portion of the country by each.

The Second and Third Partitions took place during the French Revolution. The Second Partition was the result of an attempt by Poniatowski to revise the constitution and abolish the *liberum veto*. Catherine of Russia, fearing lest Poland should become a strong state, intervened in the interest of the nobles. Frederick William II of Prussia, while refusing to aid those favouring a new Constitution, joined with Russia in again encroaching on Polish territory.

The Third Partition occurred in 1795. The Polish patriot Kosciuszko refused to submit to the dismemberment of his country, and he led a national revolt. Poniatowski refused to support the movement, and Poland,

divided against itself, fell an easy prey to its enemies. This time the armies of Russia, Prussia and Austria entered the country, and all Poland was divided among the invading Powers. A revolution broke out late in 1830, and the Russians were driven from Warsaw and independence was declared in January, 1831. The Russians soon returned, and though the Poles fought bravely, their enemies were able to recapture Warsaw in September. Several other

were little more than serfs. The educational system, too, possibly the most advanced in Europe, by creating an intelligent and independent peasantry, was of great value in welding together the varied Polish elements, who learnt to understand one another's aims and policies. National culture was, however, suppressed as much as possible. Religion was in disfavour, and the "plantation" of German families encouraged. Especially was this so under Bismarck.



"THE THREE CROWNS" IN THE PIENING RANGE, SOUTHERN POLAND

Photo Polish Travel Office

attempts for freedom were made, but none was successful. Russia retaliated by a drastic programme of Russianizing. The Russian language was made official and introduced into the schools and law courts, and the activities of the Catholic clergy were curtailed. In Galicia, or Austrian Poland, the Poles were economically exploited with the greatest severity, but were not culturally affected. There was a considerable change for the better when, about the middle of the nineteenth century, Austria, alarmed at the growing power of Prussia, realized that to retain her authority she must conciliate the dissatisfied elements in the conglomerate State. By 1914, with the rise of progressive ideas, Galicia had obtained a semi-independent position. Prussian Poland benefited materially from the efficient organization of the Prussian kingdom. The peasants could become smallholders and yeomen, while under Austria and Russia they

Poland and the World War. In 1914, Poland was invaded by German and Austrian forces, but the invasion was checked by Russian arms before Warsaw was reached. In the summer of 1915, a German "drive" captured Warsaw and drove the Russian army out of the country. Since the retreating Russians devastated the country so that the enemy might derive no subsistence from it, the people were left in a most wretched condition. Their distress increased with every year of the conflict, and thousands perished of ill-treatment and starvation, in spite of heroic efforts in their behalf.

After the country came into the possession of the Germanic Powers, the Emperors of Austria and Germany, in November, 1915, issued a proclamation promising an independent kingdom to Poland, but the proclamation did not include the parts occupied respectively by Germany and Austria. These efforts to retain their interests came to

naught with Allied victory. The Poles proclaimed a Republic in 1918, and Pilsudski became Dictator as well as first provisional President. Though his radical ideas did not meet with the approval of the Conservatives, they were appeased by the appointment of Paderewski as Premier. See PILSUDSKI.

At the Peace Conference, Paderewski presented claims for more territory, and asked for boundaries on ethnographic lines. The Treaty of Versailles, in 1919, granted to

arose with Czechoslovakia over the Teschen district, which was important for its coal and ore deposits. This dispute was settled by a Conference of Ambassadors, which gave Czechoslovakia most of the coal-mines, and Poland the city. Hostilities with Russia were more serious. Encouraged by the French, the Poles went to war with an aroused nationalist spirit and a determination to re-establish the frontier of 1772. The Poles unexpectedly drove the Russians



OJCÓW (NEAR CRACOW)

A valley with an historic cave and ruins.

Photo: Polish Travel Office

Poland on the western frontiers the greater part of Posen and some of West Prussia; left Upper Silesia with its rich mineral resources to a plebiscite; and granted Poland an outlet to the sea through a "corridor" extending to the Baltic Sea. This separation of Germany from East Prussia caused much dissatisfaction in Berlin; Poland replied that East Prussia was more a colony than an integral part of Germany. Danzig, the port of this corridor, was made a Free City. By a supplementary treaty, West Galicia went to Poland, and another provision of the treaty required Poland to sign a treaty guaranteeing religious freedom to minority populations, equal civil and political rights for all, and provision for use of the communication facilities by the Allied Powers. See PADEREWSKI.

Later History. Early in 1919, a dispute

back. The Treaty of Riga, which followed, granted additional eastern territory to Poland, and guaranteed the political sovereignty and independence of both countries.

On the heels of the Russian affair came a dispute with Lithuania over the question of Vilna. On 19th April, 1919, Poland had occupied this town and district, and held it until the summer of 1920, when the Bolsheviks compelled them to evacuate it. By the Treaty of Moscow, Russia was required to relinquish the territory to Lithuania, and Poland pledged itself not to encroach upon Lithuanian territory. But in October of 1920, General Zeligowski, with an unofficial military force, took possession of the district.

In 1923 the north-eastern frontier of Poland was fixed by the Conference of Ambassadors, and the Vilna district was

included in Polish territory. Lithuania refused to accept this decision, and continues to protest against it, though the state of war between the two nations over the question was declared ended in 1927. The city is strongly garrisoned by Poland.

Added to Poland's political troubles have been internal problems; among these is the status of the Jews. The minority treaty guaranteed religious and educational liberties, but contempt for the Jews, with their zeal for trade and their apparent lack of Polish patriotism, caused them to be ostracized socially, economically, and educationally, and kept from exercising their political rights. Protests against the Polish administration from the Ukrainians living in eastern Poland indicated a similar conflict of nationalities.

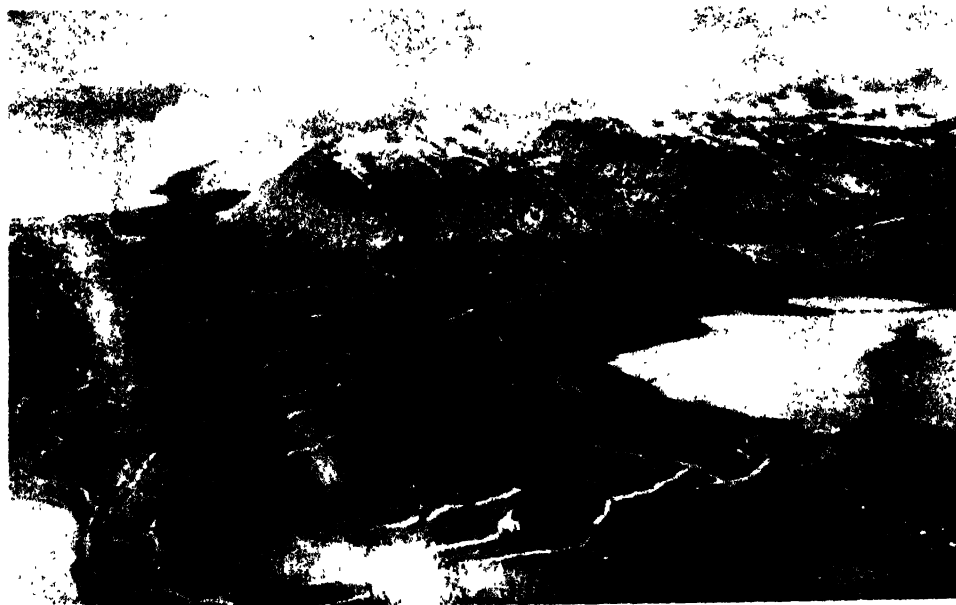
Pilsudski made himself the real dictator in the affairs of Poland in 1926. The controversy over Polish rights in the territory of the Free City of Danzig was settled, for a time at least, by a treaty concluded in November, 1932. By this agreement Poland promised to cease activities which imperilled the economic existence of Danzig, and in return, the Free City adopted a currency uniform with that of Poland and permitted greater freedom in the use of port facilities to the Polish Navy. In 1935 Marshal Pilsudski died. Poland has a non-aggression pact with Russia and an alliance with France

by treaty of mutual guarantee. Pro-German influence, encouraged by Pilsudski, has been weaker since his successor, General Rydz-Smigly, reaffirmed the defensive understanding with France. Poland, as a buffer state, has an important part to play in the preservation of peace in Eastern Europe. Poland is a member of the League of Nations.

POLAR BEAR. See BEAR.

POLAR EXPLORATION. To the ancient Greeks the regions of the north and south were mysterious zones of uninhabitable, frozen land and sea. Astronomical study led to the conviction that in Polar regions the sun must shine at midnight in midsummer and not at all in midwinter. Conjectures were made concerning the land there, and centuries before there was any serious attempt to reach either of the Poles, the Arctic regions had been visited by adventurers.

History of Arctic Exploration. About 325 B.C. a Greek named Pytheas sailed from Marseilles, then called Massilia, through the Straits of Gibraltar into the Atlantic and north along the shores of Europe to the British Isles, whence he reached a land he called Thule, which was either Iceland or Norway. In the ninth century, Iceland was reached and colonized by the Norsemen, and in the tenth century Eric the Red landed in Greenland. Svalbard, which was probably Spitsbergen, was found in the twelfth



POLAR REGIONS

An aerial photograph taken about six hundred miles south of the North Pole.

Photo: P. & A.

century. Later the strongest motive in Arctic exploration was the search for a sea route to the riches of the east in India, Cathay, and Cipango, around the north of America (North-West Passage) and the north of Europe and Asia (North-East Passage).

John Cabot in 1497 sighted Nova Scotia and discovered the Newfoundland Banks, which thereafter brought many fishermen across the Atlantic. But the real pioneers in the quest for the North-West Passage were Frobisher in 1576, Davis in 1585-87, Hudson in 1610 and Baffin in 1616. Memorials of their respective advances can be seen in the names on the map. The search for a North-East Passage began with the Muscovy Company in 1553, in which year Willoughby and Chancellor reached Novaya Zemlya and the White Sea. In 1580 Pet and Jackman reached the Kara Sea. Difficulties both to west and east prompted men to try a northward course, and so in 1596 Barents rediscovered Spitsbergen, and in 1607 Hudson reached lat. $80^{\circ} 23' N$. Then for over a century little was done, though the Hudson's Bay Company was founded in 1666. In 1778 Cook tried in turn to sail both eastward and westward from Bering Strait but failed. Before the end of the century the Arctic coast of America was reached by land by Hearne and by Mackenzie, and early in the nineteenth century Franklin, Richardson, Back, Dease, Simpson and Rae filled in much detail. Parry in 1818 nearly made the North-West Passage, reaching McClure Strait from the east. Ross in 1829 almost found an alternative route. Attempts to pass directly north from Europe were made by various explorers, and in 1827 Parry reached lat. $82^{\circ} 45' N$. with sledges. In 1845 the British Government dispatched the *Erebus* and *Terror* under Franklin to find the North-West Passage. The complete disappearance of this expedition led to many search expeditions over a long period of years and many

additions to knowledge. McClure actually made the North-West Passage, partly by ship and partly on foot, in 1851-52. Rae discovered the fate of Franklin and his men in 1854, and McLintock completed the story. Amundsen in the *Gjoa* sailed through the North-West Passage in 1903-05. Weyprecht and Payer failed to find the North-East Passage, but discovered Franz Josef Land in 1872, and Nordenskjöld in 1878-79 took the *Vega* from Europe to Japan via the north of Asia. Toward the end of the nineteenth century the North Pole became

the objective of explorers. In 1871 Hall reached lat. $82^{\circ} 11' N$. west of Greenland, and in 1875 Markham of the Nares expedition reached lat. $83^{\circ} 20' N$. This record was not beaten until 1895, when Nansen and Johansen, sledging from their drifting *Fram*, reached $86^{\circ} 14' N$. Cagni, five years later, reached lat. $86^{\circ} 34' N$. In 1886 Peary turned his attention to Arctic exploration, and for



NORTH POLAR FLIGHT IN 1897

In this year, Saloman August Andrée, a Swedish engineer, started from Spitsbergen in an attempt to drift over the North Pole in a balloon. After all trace of Andrée and his two companions had been lost for thirty-three years, their dead bodies were discovered on White Island. The photograph shows the balloon leaving Spitsbergen

several years led expeditions to Greenland, the North Cape of which he discovered in 1900. His ambition, however, was to reach the Pole; and after failures in 1902 and 1906 he succeeded in April, 1909, sledging from Ellesmere Land. Cook's claim to have forestalled him by a year was discredited. Much work in the Canadian Arctic archipelago was done by Sverdrup and Isachsen in 1899-1901, and by Stefansson in 1913-18. Russians have explored extensively north of Siberia, and in 1913 Vilkitski found Northern (Nicholas) Land. Danish, British and French expeditions in 1931 and 1934-6 scientifically explored Greenland. Norwegians have been active in Spitsbergen.

After attempts to reach the Pole by aircraft—in 1897 by Andrée in a balloon, by Wellman in 1909 in a dirigible, and by Amundsen in 1925 in an aeroplane—the feat was accomplished in May, 1926, by R. E. Byrd of the United States Navy, in a Fokker aeroplane, and by Amundsen and Ellsworth, in the *Norge* dirigible.

Byrd reached the Pole and returned to Spitsbergen, a 1500-mile flight, in 15 hours 51 minutes. The *Norge*, after flying over the Pole, continued its journey to Teller, Alaska, 75 miles north-west of Nome.

In 1928 the Pole was again reached by G. H. Wilkins and K. B. Eielson. On 21st April they flew from Point Barrow, Alaska,

and Alexander Land. In 1823 Weddell discovered the sea which bears his name. In 1831 Biscoe found Enderby Land, and in 1833 Kemp discovered Kemp Land. In 1839 Balleny explored the islands known as the Balleny group. In 1840 Wilkes discovered Wilkes Land. Ross in 1842 reached 78° 10' S., the highest southern



IN THE GRIP OF THE POLAR ICE.

Endurance, the ship in which Shackleton made his attempt to reach the South Pole in 1914-16, is seen caught in the ice of the Weddell Sea, where she eventually sank. One of the crew is bringing food to the dogs, whose kennels are miniature igloos.

to Green Harbour, Spitsbergen, a distance of 2200 miles, in 20½ hours. In 1928 Nobile's airship *Italia*, after a flight over the Pole, crashed near Spitsbergen.

Dr Jean Charcot (see below) was drowned when his ship was wrecked off Iceland in September, 1936, while returning from an expedition across Greenland.

History of Antarctic Exploration. Captain James Cook was the first man known to have sailed across the Antarctic Circle. On 30th January, 1774, he reached latitude 71° 10' S., over 4° south of the Circle, and in a circumnavigation of the Antarctic made several other attempts to push south. Bellingshausen, in 1821, discovered Peter I Island

record until 1900. Dumont d'Urville found continuous coast from 136° to 142° E., and to it gave the name of Adélie Land.

In 1874 the *Challenger* crossed the Antarctic Circle. In 1895 Borchgrevink landed at Cape Adare, the first to set foot on the Antarctic continent, in 1898 he actually reached latitude 78° 50' S. In 1898 a Belgian expedition made scientific discoveries in Graham Land.

In 1901-3 R. F. Scott explored Victoria Land and the Great Ice Barrier and reached lat. 82° 17' S. In the same year von Drygalski discovered Wilhelm Land, and in 1903 Bruce discovered Coats Land and explored the Weddell Sea. In 1902-3 Nordenskjöld

made discoveries in Graham Land, and in 1904-5 Charcot found Loubert Land, and in 1908-10 Charcot Land. In 1907 Shackleton reached lat. $88^{\circ} 23' S.$, and his expedition located the South Magnetic Pole. In 1910 Scott returned south and in January, 1912, with four companions reached the South Pole, but the whole party perished on the return journey. In the previous December, Amundsen had reached the Pole and returned safely to his base. Filchner in 1912 found Luitpold Land and the Weddell Barrier, and Mawson in 1911-14 mapped much of the coasts of Antarctica east of Wilhelm Land. Shackleton's expedition of 1914 to the Weddell Sea led to the discovery of the Caird coast. In bringing succour to his stranded men after the loss of his ship, Shackleton and five companions made a remarkable boat's journey to South Georgia. Flying began in the Antarctic in 1928, when Wilkins flew over Graham Land, recast its map, and discovered Hearst Land. In 1929 Byrd and Balchen flew from the Ross Sea to the South Pole and back, and made discoveries to the east of the Ice Barrier. Norwegian whalers frequenting Antarctic seas in the last decade have added many discoveries, including lands between Enderby Land and Coats Land. In 1930 and 1931 Mawson returned to the Antarctic and mapped in the greater part of the unknown edge of the continent from Enderby Land eastward. In 1933 Byrd sailed from the Ross Sea with a second expedition, and in 1934 Rymill led an expedition to Graham Land to solve the remaining problems of the outline of the Antarctic continent. Ellsworth and Kenyon in 1935 flew 1550 miles across Antarctica from Graham Land to the Ross Sea. *Discovery II*, working in the interests of whaling research under the auspices of the Falkland Islands Government, did much scientific work in 1925-27.

Political Control of Polar Regions. The whole of Arctic lands are now claimed by various States. Canada claims and polices its Arctic Archipelago, Denmark controls all Greenland, Norway rules Svalbard (Spitsbergen and Bear Island) and Jan Mayen, and Russia claims the islands lying north of her European and Asiatic territories. In the Antarctic are the Ross dependency of New Zealand, the Antarctic territories of Australia and the Falkland Islands dependencies. France claims Adélie Land and Norway Bouvet Island and Peter I Island. These latter claims are in the interests of whaling, and they control no permanent populations. See ANTARCTICA; ARCTIC REGIONS.

POLARISCOPE, *po lar' ri skope*. An instrument for producing and testing polar-

ized light. It consists of a polarizer and analyser, mounted so that they can be rotated on a common axis and be several inches apart, in order that the crystal or



POLARISCOPE

substance to be studied may be placed between them. When a polariscope is equipped with a graduated circle, so that the angle through which the analyser is rotated can be accurately read, the instrument is usually called a *polarimeter*. See POLARIZATION OF LIGHT, below.

POLARIZATION OF LIGHT. The condition in which light waves are limited to a single plane. If we watch the motion of some floating object, say a box, as the waves roll in over a lake to the shore, we note that the box bobs up and down as the waves pass by it. This means, of course, that the water under the box is doing the same; the motion



FIG. 1

In the first figure light is passed through tourmaline crystals *ab*. In the second figure light is cut off by crossed tourmaline crystals

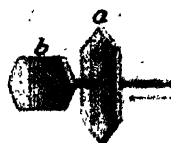


FIG. 2

of the water is oscillatory and in a vertical plane. But if we observe the motion of a limb on a tree when a gusty wind is blowing, we see that it oscillates to and fro in a horizontal plane. Now if we could see the motions of the ether as a light wave is approaching our eye, we would observe that, in general, the vibrations that produce light-waves are not confined to a single plane. They may be said to be taking place in all planes. There are several ways, however, in which we may cause the vibrations to take place in one plane only, in which case we have plane-polarized light. The two common methods are as follows—

Polarization by Reflection and Transmission. Suppose that a ray of light strikes obliquely the surface of a plate of glass. We can understand that the vibrations which are parallel with the surface are reflected more easily than the vibrations which are taking place perpendicular to the surface. This means, then, that if we examine the reflected light, it will contain an excess of light whose vibrations are in the plane parallel with the glass surface, which means

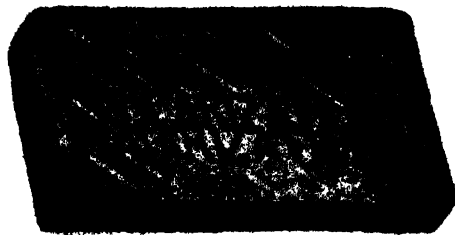


FIG. 3

that the reflected ray is partially polarized. It is evident that the transmitted beam would likewise contain an excess of light vibrating at right angles to the surface of the glass, and therefore it, too, would be partially polarized. The polarization can be made more nearly complete, but never entirely complete, by using a number of glass plates.

Polarization by Double Refraction. When a ray of light passes obliquely from one medium into another in which it travels at a different rate, the ray is bent, or refracted. Iceland spar is a crystalline substance which has the peculiar property of permitting light to pass through it at a certain velocity if it is vibrating in one plane, and at a different velocity if it is vibrating in a plane at right angles to the first. Consequently, when a ray of light strikes such a crystal, it is divided into two parts, one of which is bent or refracted more than the other, because it does not travel as fast as the other. After passing through the crystal, these two rays of light have been separated because of this double refraction; the light in one of them is vibrating in one plane, and that in the other is vibrating in a plane at right angles to the first. Since a crystal of Iceland spar is transparent to waves of all colour, and since the two beams of light that go through such a crystal are completely polarized, the one in one plane and the other in a plane at right angles thereto, the use of such crystals is far preferable to any other means of obtaining polarized light. By sawing in two a crystal of Iceland spar in a certain direction and cementing the two parts together with Canada balsam, one of the beams of

polarized light may be eliminated, leaving light polarized in one plane only. Such a crystal is called a *Nicol prism*.

Rotation of Plane of Polarization. There are certain substances, of which quartz is an example in the case of a solid, and a sugar solution one of a liquid, that have the property of rotating the plane of polarization of light as it passes through them. This means that a light wave whose vibrations are in a certain plane as the light enters the substance will emerge from the substance with vibrations in a totally different plane. Dextrose sugar rotates the plane of polarization to the right, and levulose sugar to the left, the amount of rotation depending on the percentage of sugar in the solution.

POLE. As a geographical term, this is either end of the axis about which the earth rotates daily. One pole, ninety degrees north of the equator, is called the North Pole; the South Pole occupies a corresponding position at the southern end.

In physics the term is used to designate the points of a body at which its attractive or repulsive force is concentrated. The magnetic poles of the earth are points on the surface where the magnetic needle is vertical, or upright. See **MAGNET AND MAGNETISM**.

In astronomy, the poles are the points on the celestial sphere where the axis of the earth appears to meet it when produced (in either direction). About these points the heavens appear to revolve.

POLE, REGINALD (1500-1588). A cardinal and Archbishop of Canterbury. Pole may be regarded as the last of the great English medieval churchmen, yet he belonged in every sense to the period of the Counter-Reformation. Son of the Countess of Salisbury, he was related through her to the Plantagenet line, for she was niece to Edward IV. The fact that the royal blood of England ran in his veins explains his importance, apart from his undoubted abilities, in the eyes of Henry VIII and of all Europe. Educated at the Universities of Oxford, Padua and Paris, Pole early gave evidence of his qualities, and was on terms of intimacy with the great figures of the Renaissance in



CARDINAL POLE.
(National Portrait Gallery)

England and Italy. Henry VIII showed him his patronage, and although not ordained priest, he received many ecclesiastical appointments, including the deanery of Exeter.

The question of Henry's divorce, and his



POLECAT
Photo U. & U.

assumption of the supremacy of the Church, led to a break between the King and Pole, and to ease the tension, the King granted him permission to retire abroad, at the same time offering him the Archbishoprics of York and Winchester as an inducement to him to change his opinions. The split between them grew wider, and in 1537, the year after he was made Cardinal, Pole endeavoured to obtain the help of the Emperor and the king of France to help a revolt in England and depose the king.

As a churchman, Pole is chiefly memorable for his work at the Council of Trent and the zeal he showed in urging the delegates to make decrees on matters of faith and reform. In 1549, on the death of Pope Paul III, Pole was the favourite candidate for the papacy, and only just failed to be elected.

On the death of Edward IV and the election of Mary, Pole was the foremost Englishman in the eyes of Europe, and many favoured his marriage with the Queen, for though a Cardinal, he was not yet a priest. The project fell through, however, and he returned to England as legate of the Pope to grant absolution. He was appointed Archbishop of Canterbury and at once began to put into effect the decrees of reform enunciated by the Council of Trent. It cannot be shown that he was connected in any way with the persecutions initiated by Mary.

His last years were clouded by the ingratitude and enmity of Pope Julius III.

POLE-AXE. An instrument used for slaughtering animals. The handle of the axe is of ash or hickory, and at the back of the axe head is an elongated iron bar, which is driven into the skull of an animal, making it, when the axe is accurately aimed, completely unconscious. The axe is then withdrawn, and a piece of cane is forced through the hole made by the axe into the brain as far as the spinal cord. Death is then instantaneous. If the instrument is not aimed accurately, then the animal suffers considerable pain,

and there has grown up an agitation to make its use illegal.

POLECAT. An animal belonging to the weasel family. It was once widely distributed throughout Europe, but is now being exterminated in many places because of its destructive habit of feeding on domestic fowl of various sorts, though its diet includes rats, mice, eggs and wild birds. In common with the skunk, it secretes, and can discharge at will, a liquid of a most disagreeable odour. The common variety is about 17 in. long, with a tail 6 in. in length. Its long, loose, dark-brown fur is marketed under the name of *fitch*. The ferret is an

albino variety of the European species. See SKUNK; WEASEL.

Scientific Name. The polecat belongs to the family *Mustelidae*. Its scientific name is *Putorius putorius*.

POLE, DE LA, HOUSE OF. See SUFFOLK, DUKES AND EARLS OF.

POLEMARCH, *pol'e mark*. In ancient Greece, a war archon. See ARCHON.

POLESTAR, OR STELLA POLARIS. A name given to the North Star, the brightest in the constellation Ursa Minor, or Little Bear. It is described in the article NORTH STAR.

POLE VAULT. A sport in which the players leap over a horizontal bar with the aid of a pole. The aim is to clear an easily



POLE VAULT
The jumper is about to release the pole.
Photo: U. & U.

dislodged bar, supported by two uprights. The vaulting pole, made of light wood (often bamboo), is 13 to 16 ft. in length. The vaulter, having measured the height of the bar, takes an undergrip with his right hand about 6 in. above this point. The left hand,

with an undergrip, seizes the pole at a little over a foot below the right. The vaulter approaches the crossbar at a run, rests the end of the pole in a wooden slideway set in the turf, and lifts himself into the air



POLE VAULT

The athlete has cleared 13 ft. 2 in.

Photo: U. & U.

while thrusting his legs forward with the aid of the pole. He must go over the bar without dislodging it. The world's amateur

record for this event, made in 1935, was 14 ft. 5½ in. (height of jump).

POLICE. A word derived from the Greek *polis*, a city, implying the government of a city in regard to the preservation of law and order and the enforcement of civil law; hence, in modern sense, a body of authorized and attested persons, military, semi-military or civil, charged with the maintenance of law and order. The word "police" is credited with having been introduced into England about the beginning of the eighteenth century from France in connection with the management of towns and parishes, especially in regard to lighting and scavenging.

History. The fundamental principle of policing has little changed since Saxon days, when the ascendancy of the King over tribal chieftains imposed upon the kingdom a form of civil feudal system which was later developed by the Normans into a military system. Under King Alfred the ealdormen were appointed the King's delegates, and were held responsible to him for the maintenance of law and order. Offences against the person were held to be offences against the King's Peace, i.e. the State. This was a development of the Frankpledge system, wherein every freeman was held sponsor, bail, or pledge for the well-behaviour of his neighbours in the same group of the community (i.e. tithing, hundred and shire) as himself. The responsibility for law and order was therefore local and mutual—two features in police administration that have been maintained to the present day. The tithingman, by virtue of his office, was the prototype of the modern constable (which see).



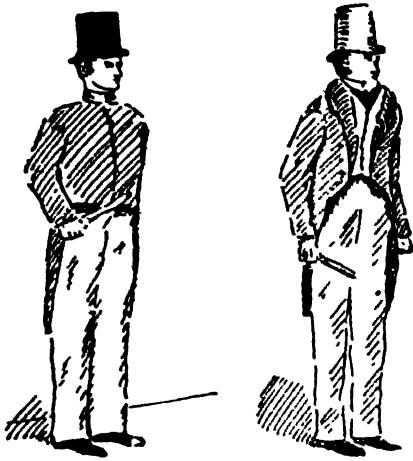
"CHARLIES" OR "BELLMEN"

By courtesy of "The Police Chronicle" and "Constabulary World"



A BOW STREET RUNNER (LEFT) AND AN EARLY "PEBLER" OF THE METROPOLITAN POLICE

From medieval times to the end of the eighteenth century, policing was effected by watchmen, variously known as "bellmen," owing to the bell they carried as warning of their approach, or "Charlies," after King



"PEELERS"

The one on the right is an early Manchester constable
By courtesy of "The Police Chronicle" and "Constabulary World"

Charles II. In 1749, Henry Fielding, the novelist and magistrate at Bow Street, assisted by his half-brother, Sir John, who

later followed him in the Bow Street magistracy, evolved the first definite scheme of organized police in the force known as the Bow Street Foot Patrol (or Bow Street Runners), which replaced the corps of poorly-paid and inefficient watchmen by a body of well-paid "thief-takers," specially trained in the detection of crime. The system was developed and proved a comparative success. In 1803, Sir Patrick Colquhoun published his *Treatise and Duties of a Constable*. He emphasized that the only sure and permanent foundation of a police system was in a preventive policy.

In 1814, when Secretary of Ireland, Sir Robert Peel introduced a Bill relating to the general policing of Ireland. In 1826, when back in England, Peel began collecting evidence on criminal statistics and matters, as previously Colquhoun had done. In 1829, when Home Secretary, Peel introduced into Parliament the "Metropolis Police Bill" for "Improving the Police in and near the Metropolis," and to the placing of this measure upon the Statute Book our modern police, as we know it, dates its origin. Notwithstanding some preliminary opposition, Peel's "New Police," dressed in uniforms of swallow-tail jackets, trousers and top hat to betoken their civilian character, proved their worth. Robberies and other crimes decreased, and the "Peelers," or "Bobbies"—by which they became popu-



POLICE

1. A "Peeler" guarding a prisoner in the stocks at Rugby in 1866. 2. "Take Cover" was the air raid warning given in England during the World War on the news of approach of enemy aircraft. 3. A frequency panel in the police wireless station at Denmark Hill, London.

Photos: Photopress; Topical; Fox



POLICE

1. The entrance to Scotland Yard as it was in 1824. 2. Old Scotland Yard. 3. New Scotland Yard. 4. Using a comparison microscope (by which signatures, finger-prints, etc., can be compared with ease and accuracy) in the Nottingham police laboratory, which became the first national police laboratory. 5. In the photographic department at Scotland Yard. 6. Examining finger-print records 7. Taking finger-prints. The fingers are cleaned, then pressed on the inked slab, and finally pressed on the paper.

Photos: Photofest, Topical

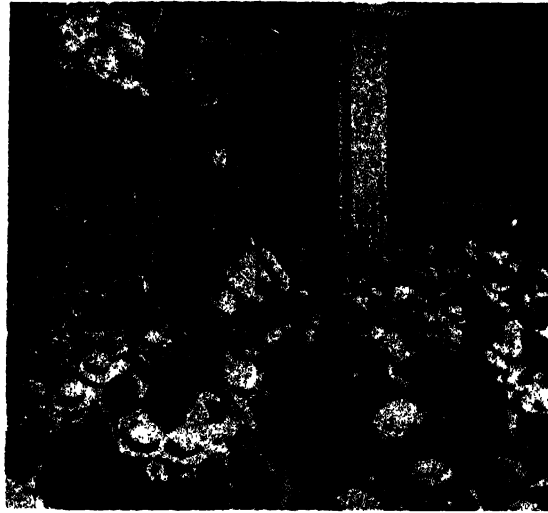
larly known after their founder—soon gained the public confidence. In 1839 the City of London remodelled its heterogeneous police forces on the lines of Peel's Metropolitan Police. Consequent upon the passing of the Reform Act in 1832, bodies of paid constables were allowed to the new boroughs created by that measure. *Watch Committees*, controlling local police in the boroughs, were formed under the Municipal Corporations Act, 1835, while the Municipal Corporations Act, 1882, and the Local Government Act, 1888, further extended, consolidated and co-ordinated local police control. County Constabularies in England, controlled by *Standing Joint Committees*, were authorized under the County and Borough Police Act of 1856. Scottish county constabularies were formed under an Act of 1857, while the police in the Scottish burghs were formed under the Scottish Burgh Act, 1892. Special constables date from the Special Constables Act, 1831, strengthened later by clauses in the 1835 and 1882 Municipal Corporations Acts. In Ireland are the Royal Ulster Constabulary, with Headquarters at Belfast, policing Northern Ireland; and the Civic Guard, with Headquarters at Dublin, policing the Irish Free State. The Royal Irish Constabulary, which was replaced by these two bodies, was formed in 1836, although Dublin had a police force of its own, created by statute in 1786. In the British Empire are various police forces, mainly of a semi-military nature. These include the Indian Police, the Royal Canadian Police, the South African Police, and the various police forces of the Australian states, the Canadian provinces, and the various colonial depend-

Organization. In Great Britain, police forces are commanded by chief constables acting under the authority of Watch Committees in the boroughs and Standing Joint Committees in the counties. The Metropolitan Police and the City of London Police

are controlled each by a Commissioner of Police, the former Force being under the direct control of the Home Secretary, the latter Force under that of the Common Council. The Home Secretary also, through H.M. Inspectors of Constabulary, partially controls the borough and county police, who are financed half by local rates, and half by Government grant, which is subject to the maintenance of efficiency as reported upon by H.M. Inspectors. Post-war develop-

ments in the organization of the police include the recognition of the *Police Federation*, representative of ranks including and below that of inspector, to discuss and bring to the notice of the local police authorities and of the Home Secretary matters affecting the welfare of the police, as distinct from questions relating to discipline and promotion. The *Police Council* is a body re-

presentative of police authorities and officials, for the purpose of discussing special matters affecting police administration, organization and welfare. Pensions are regulated by the Police Pensions Acts of 1921 and 1926. In Great Britain there are approximately 240 separate police forces. In 1932, as a measure of economy in police administration, Government attention was directed toward amalgamating the smaller forces with larger units of administration. Twenty-three forces, in boroughs having a population of less than 30,000, were recommended by a Special Committee to be merged. An interesting feature of the report of this committee was its recommendation that no county borough should be deprived of its right to maintain a police force—thus preserving the local element that has subsisted in police administration since Saxon days. Other modern developments include the organization of women police, and the establishment in 1934 of a Police College at Hendon for the training of officers for the Metropolitan Police. The recruits to the rank and file are trained at



A Suffragette demonstration at Constitution Hill, London, in 1913.

Photo: Photopress

Peel House. The Headquarters of the Metropolitan Police are at New Scotland Yard. The total strength of the police forces of Great Britain is approximately 67,000 all ranks, the Metropolitan Police mustering approximately 20,000. Police organization is divided into two main branches, the uniform branch and the plain clothes branch, or Criminal Investigation Department, (C.I.D.), into which each of the larger forces is divided. The uniform branch is concerned with the preservation of law and order, the C.I.D. with crime detection. Other sections include administration, women police, mounted police, transport and mechanization, and the river police (in London). Many forces now have their own crime laboratories, equipped with cameras, microscopes, and chemical apparatus, as well as wireless and telegraphic sections, one of the latest developments being the installation in some forces of the Telex system of communication for the simultaneous transmission of information.

POLISH CORRIDOR. A territory between Germany and Poland which provides Poland with an outlet to the Baltic Sea. See DANZIG; POLAND.

POLISH LITERATURE. Very little is known of Polish Literature before the Middle Ages. Most of medieval Polish literature is written in Latin or is a translation of the Latin (e.g. the translation of the Bible made about the year 1455 for Queen Sophia of Poland).

The sixteenth century is a great period in Polish literature, profoundly influenced by the Renaissance. The poets Nicholas Rej of Naglowice (1505-1569), Jan Kochanowski (1530-1584), and Nicholas Szarzynski (1550-1581) and the Jesuit prose-writer Peter Skarga (1536-1612) belong to this period. Kochanowski's poetical paraphrase of the *Psalms* and Skarga's *Lives of the Saints* are Polish classics.

Italian influence is strong in the literature of the seventeenth century. Peter Kochanowski's translation of Tasso's epic poem inspired a number of epic poems, especially those of Wacław Potocki (1625-96).

The extravagance of Italianate writing led to such decadence in Polish literature in the early part of the eighteenth century that a reaction against Italian influences set in during the last forty years of the century. These forty years were a time of considerable development in prose and dramatic work. Julian Niemcewicz's *The Return of the Deputy* (Powrót Póśla) is a well-known comedy.

The Romantic movement gave vitality and richness to nineteenth-century literature, though one of the best Polish comic dramatists who was writing at this time,

Count Alexander Fredro (1793-1876), belonged to the classical tradition. The principal writers of the Romantic movement were Adam Mickiewicz (1798-1855), Juliusz Słowacki (1809-1849), and Zygmunt Krasiński (1812-1859).

Towards the end of the century the inevitable reaction against Romanticism took place, and the cult of realism and utilitarianism began in Polish prose and poetry. The poet Adam Asnyk (1830-97) and the novelist Eliza Orzeszko (1842-1910) were exponents of realism.

Then realism gave place to the individualism of the "Young Poland" group of writers, who demanded the right of individual expression and protested against the utilitarianism of the realists.

Prominent among the poets of to-day is Miss J. A. Illakowicz, whose poetry has a fine lyrical quality.

POLITICAL ECONOMY. See ECONOMICS.

POLITICS AND POLITICAL PARTIES. Politics are the act of government, and from the earliest times must have been a topic of absorbing interest. For as soon as men became grouped in societies, some constraint for the good of the society must have been imposed upon individuals. The difficult question is, and always will be: how far shall restriction be carried, and what means shall be adopted to enforce the restriction? Distinct cleavages in opinion soon appeared, and are with us now. Some contend that government activity has failed to promote the general welfare, and are anxious to confine that activity within narrow bounds. Prejudiced in favour of individual freedom, they argue that restraint upon it cannot be justified except by most urgent reasons. Others, obsessed by the evident defects of individualism, turn to the State—to the community organized for purposes of government—as the great hope for humanity. Two facts strengthen, in these times, the tendency among men to study the effects of State action upon welfare. The first is that many an industrial enterprise is so powerful that the State alone can curb its power. The second is that the "State" nowadays includes almost the whole adult population. Politics are now—and very rightly—a topic that interests all; what functions shall the State perform? who shall guide the State in the due performance of those functions? how shall the laws be enacted to which individuals shall be obliged to conform; what relations shall subsist among the various parts of Government—the law-making part (the Legislature), the law-executing part (the Executive), and the law-interpreting part (the Judiciary); where shall the supreme power in the State rest?

The man or woman with strong opinions upon questions of politics will, most likely and very sensibly, become a member of one of the great political parties. Only thereby can opinions be translated into action. The opinions may be founded upon excellent reasons; still, they will remain mere opinions unless many are persuaded to adopt them. Although at times there is a suspension of the "party system," usually in times of national crisis, such suspension is only temporary, for the party system appears to be consistent with human nature. There will be a party in power, providing the chiefs of the various Departments of State, guiding and controlling the legislation, and administering the country's affairs—all in conformity with what the party conceives to be the best interests of the community. There will be a party or parties not in power, and the largest of these is known as "His Majesty's Opposition"—destined sooner or later to supersede the party in power if it can win a victory at the polls, and charged with the present duty of subjecting legislation and administration to effective criticism.

Political power before the Industrial Revolution was shared by an aristocracy of landowners. During much of the period, a Whig oligarchy at the centre was curbed and checked by a Tory oligarchy of landowners in the country. "Whig" (a whining Scots Covenanter) and "Tory" (a bog-trotting Irish noble) were at first terms of opprobrium. Only gradually did they become the accepted names of the parties that in turn controlled the State. Truculent critics may affirm that the only real point of controversy between Whig and Tory was in regard to office. But there were real differences of opinion.

So far as they differed, we may express the distinction thus. The Whig belonged to the party that supported the Revolution of 1688; that sought to subordinate the power of the Crown to that of Parliament and the upper classes; that ultimately forced the Lords to pass the Reform Bill; and that developed into the Liberal Party. The Tory belonged to the party that opposed the Revolution of 1688; that were the "King's friends" when George III sought to revive the power of the Crown; that opposed the Reform Bill of 1832; and that developed into the Conservative Party. The two great parties connoted, too, religious and social differences which, in broad outlines, still persist. The Whig was the party of unprivileged dissent and of the merchant class. The Tory was the party of the Anglican Church, with its monopoly of lucrative appointments, and of the landowners.

While the country was mainly agricultural

and before the advent of industrial democracy, the landless man had no political power; nor did he seem to resent the want. As Professor Trevelyan notes of the eighteenth century: "The British working man, then called the 'honest yeoman' or the 'jolly 'prentice,' was quite happy drinking himself drunk to the health of the 'quality' at election time. And even if he had no vote, he could stand cheering or hooting in front of the hustings, while the candidate, possibly a Peer's son, bowed low with his hand on his heart and a rotten egg in his hair, addressing the mob as 'gentlemen,' and asking for their support as the chief object of his ambition." Dickens's picture of the Eatanswill election is only a slight artistic exaggeration. The periodic recurrence of such elections did at any rate keep interest in politics lively; and doubtless the sight would, for the more thoughtful, arouse vague questionings about the justice of the exclusion of the majority from the powers and emoluments enjoyed by governors.

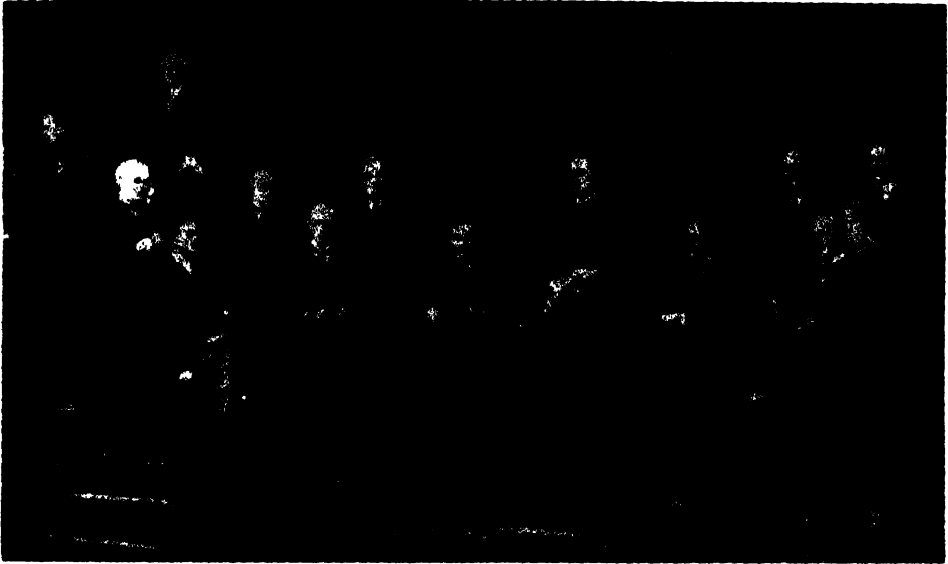
Inevitably came into existence a party, ultimately called *Radicals*, that sought for drastic, almost revolutionary changes, in the structure of society. To them an authority not derived directly from the people deserved no reverence; and their efforts must be directed toward its supplanting. The will of the majority was to prevail; and in the expression of that will the poor man's voice—the poor woman's voice, too—was to be as potent as the rich man's.

Thus the immediate forerunners of our present parties are grouped (always with movements from one group to another, as convictions change or interest impels) into Conservatives, Liberals, Radicals—the Conservatives anxious to preserve all that is good in our system of government and holding that the presumption is against change; the Liberals with their watchword of freedom in speech and in action, willing to adventure on new ways in the hope of improvement; the Radicals, prepared to root up the foundations of the old system in order to build a new and much more glorious edifice. Questions upon which members of various parties feel intensely—upon which, therefore, divergences cannot be reconciled—bring about transitory cross-divisions. Home Rule for Ireland, originating the Unionist Party, was one of these.

As we should expect from our propensity to compromise, there has hitherto been no very great difference between the practice of the parties once they attained office. It was Sir Robert Peel with his Conservative majority who in 1846 abolished the duties

on imported wheat. At some periods, indeed, it might have seemed that the Conservatives were the hastening, innovating party and the Liberals the retarding party, intent upon standing on the ancient ways. Under Disraeli's direction (1874-1880), for instance, the new Conservatism devoted itself to social reform and conciliation with the working classes. Its trenchant war on slums and insanitary conditions was marked by the Public Health Act of 1875 and the

We may perhaps take the attitude toward what is called the "capitalist system" as marking the essential distinction between the Labour Party and the traditional parties. The basis of that system is the right to use one's private property, whether land or houses or money, as one pleases. That includes the right to use property for the purpose of earning profits by trading or manufacturing. The ownership of capital carries with it, if the owner chooses,



MEMBERS OF THE NATIONAL GOVERNMENT CABINET (1931-5) PORTRAYED IN WAX AT MADAME TUSSAUD'S

Mr. Anthony Eden is seated on the left, with Lord Hailsham standing behind him and Mr. J. H. Thomas opposite him at the other end of the table. Mr. Stanley Baldwin is standing in the centre with Mr. Ramsay MacDonald on his left and Mr. Neville Chamberlain on his right. Sir John Simon stands to the right of Mr. Chamberlain.

Photo. Photopress

Artisans' Dwellings Act These continued and supplemented the work of the Liberals under Gladstone—work of which the chief result is the Local Government Board, first set up in 1871. The cessation of the privileged position of the Established Church and of land-owners, with a broadening of political power through successive extensions of the franchise, were tending to obliterate old distinctions between the historic parties. One of the greatest extensions of democratic control, the County Council Act of 1888, was the scheme of a Conservative Member, Mr. Ritchie. This Act set up the popularly elected bodies to rule the counties; it enlarged urban democracy by turning all towns of over 50,000 inhabitants into County Boroughs; and it created the London County Council to govern all London except the "City" area.

the right to control industry. A man can buy land, can build a factory, can conclude bargains with those who sell their services; so doing he decides how the resources of the community shall be employed. Conservative and Liberal alike are satisfied that this basis of the economic structure is sound. Both agree that abuses of power by the capitalist ought to be guarded against—as indeed they are guarded against by a continuously growing array of statutory restrictions. The system itself, however, consistent as it is with human nature, ought to remain. The Labour view, so far as it is clearly enunciated, maintains, on the other hand, that the system should wholly be replaced; that the means of production and distribution should be owned by the people. Tinkerings with the system will be mere palliatives of no lasting effect. The right

of the owner of property should be restricted to the right of consumption.

See **GOVERNMENT**; also articles on the separate political parties.

POLK, JAMES KNOX (1795-1849). An American statesman, the eleventh President of the United States, during whose term was fought the Mexican War. The cause



PRESIDENT POLK
Photo: U. & U.

was the claim by the United States to Texas. Justification for President Polk's order to the army to invade the disputed territory can hardly be found, but it is explained by the feeling that the cession of Texas to Spain in 1819 was a mistake which should be rectified by reannexation.

While the United States was at war with Mexico, there was also great danger of war with Great Britain. The United States claimed that the line of 54° 40' N. latitude was the northern boundary of the territory acquired from France and Spain, whereas Great Britain insisted that the Columbia River was the boundary. The Senate, on 15th June, 1846, accepted the compromise offered by Great Britain, to fix the boundary at the 49th parallel.

POLLACK. Related to the cod and the whiting, the pollack is a strong predatory fish, haunting rocky, weedy ground off the western and south-western coasts of Britain

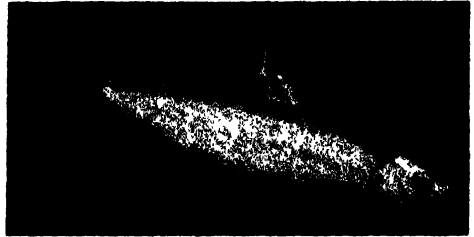


POLLACK
Photo: Waller

and on suitable ground along European coasts from Scandinavia to Spain. It is keenly sought after by anglers owing to its strength and size—it reaches a weight of over 20 lb.—and is a stubborn fighter when hooked. It resembles the cod-fish and, to some extent, the haddock, in general appearance. It has little value as food.

Scientific Name. *Gadus pollachius*.

POLLAN. One of the oldest species native to British waters, the Pollan is the Irish representative of the "fresh-water herring" family of which the powan (which see), vendace and gwyniad are members. Pollan are netted in enormous numbers from Lough Neagh. They are typically herring-like in



POLLAN
Photo: Waller

appearance, but differ from the salt-water fish in habit in that, except at spawning time, they haunt, the deepest, coldest waters of their native lakes. Pollan are not found in rivers nor in running water generally. They reach a weight of 2 lb. or more and are excellent as food.

Scientific Name. *Coregonus pollan*.

POLLARDING. A pollarded tree is one in which the head or main shoot has been cut at a height of 6 ft. or so above the ground. This must not be confused with coppicing, in which the shoots are cut more or less at ground level. The aim of pollarding is usually to produce a number of long, straight poles, which are allowed to grow for a number of years according to the rate of growth of the tree, and then cut back again. Willows, poplars, beeches, and limes are the trees most frequently pollarded in Britain.

POLLEN AND POLLINATION. Grains of pollen formed in the anther of a flower, when carried to the stigma, or seed-bearing part of a similar flower, by insects, wind, or other agencies, cause fertilization of the ovules or egg-cells, with the subsequent growth and division of the egg-cell to form the embryo. The pollen grains are minute structures of various forms, smooth or covered with spines or knobs, but always the same in the same plant.

Pollination is merely the transfer of the pollen to the stigma. *Self-pollinated* flowers are those in which this transfer is accomplished between the anther and stigma of the same flower without the assistance of outside agencies, while *cross-pollinated* flowers are those which must depend upon other agents to carry the pollen of one flower to the stigma of another. Self-pollinated flowers are often inconspicuous and scentless, since

they do not need to attract the attention of insects.

When flowers are not adjusted for self-pollination, they are equipped with various aids helpful in cross-pollination. In some the showy blossom, in others the fragrant scent, and again in others the sweet nectar, attract insects to the flower.

The most important carriers of pollen are the honey-bees, which sip from the flowers



TYPES OF POLLEN GRAINS

(a) Dandelion; (b) hemp; (c) gentian; (d) squash.

the nectar which they convert into honey. They rub the grains of pollen on their hairy bodies, and they are provided with two tiny cups on the hind legs for the carrying of pollen to their nests, but that which is scattered over the bodies is shaken off on the flowers they afterward visit. Usually, the flowers whose colour attracts bees are red, blue, or pink; in yellow and white blossoms, it is the nectar that attracts the insects

Ants, beetles, moths and butterflies are other pollen-carriers. Some flowers are adapted to pollination by certain insects. Those which give off their fragrance at

by small short-tongued insects, although the pollen grains can easily be reached by the tongues of bees. In the snapdragon, the little trapdoor concealing the pollen can be pushed open only by large insects.

An interesting example of the dependence of a flower upon one particular kind of insect is seen in the fig, which cannot produce seed that will grow unless pollinated by a small wasp. The bloom of the yucca tree is pollinated only by the yucca moth, which lays its eggs in the flower.

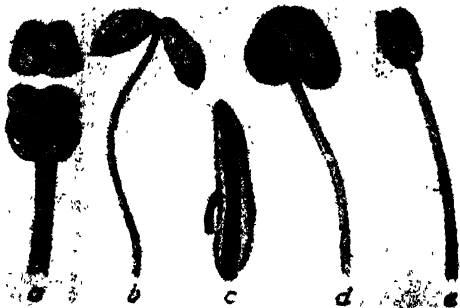
The wind scatters the light, dry pollen of many flowers, weeds, grasses and trees. See BEE; FLOWERS; SEEDS, etc.

POLL TAX. The name formerly given to a uniform tax levied upon male citizens without reference to their property, income, business or employment. (The term comes from the old word *poll*, a head; the tax is also called a *capitation* tax, from Latin *caput*, head.)

The last occasion in English history of the imposition of a poll tax was in 1698. Three hundred years earlier, such a levy was the occasion of Wat Tyler's Rebellion (which see).

Many states of the U.S.A. use this tax as a means of raising revenue, and in some of them the right to vote depends on the payment of a poll tax. It is an unpopular tax, since the people naturally feel that government revenue should be levied on property.

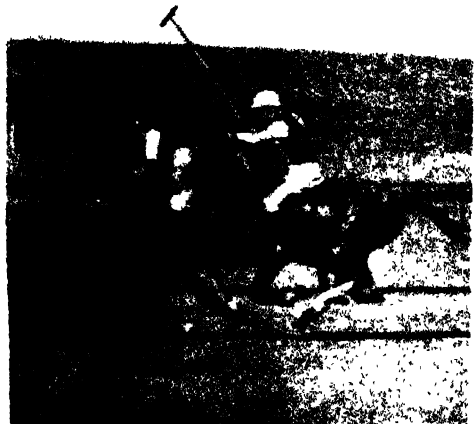
POLLUX. In Greek mythology, one of the twin sons of Zeus and Leda. See CASTOR and POLLUX; GEMINI



POLLINATION

(a) Stamen of moonseed, shown in section; (b) stamen showing two anther cells diverging; (c) stamen of globe amaranth, open from top to bottom, showing pollen; (d) stamen of mallow; (e) stamen shown split down between the two cells—the means by which the pollen escapes.

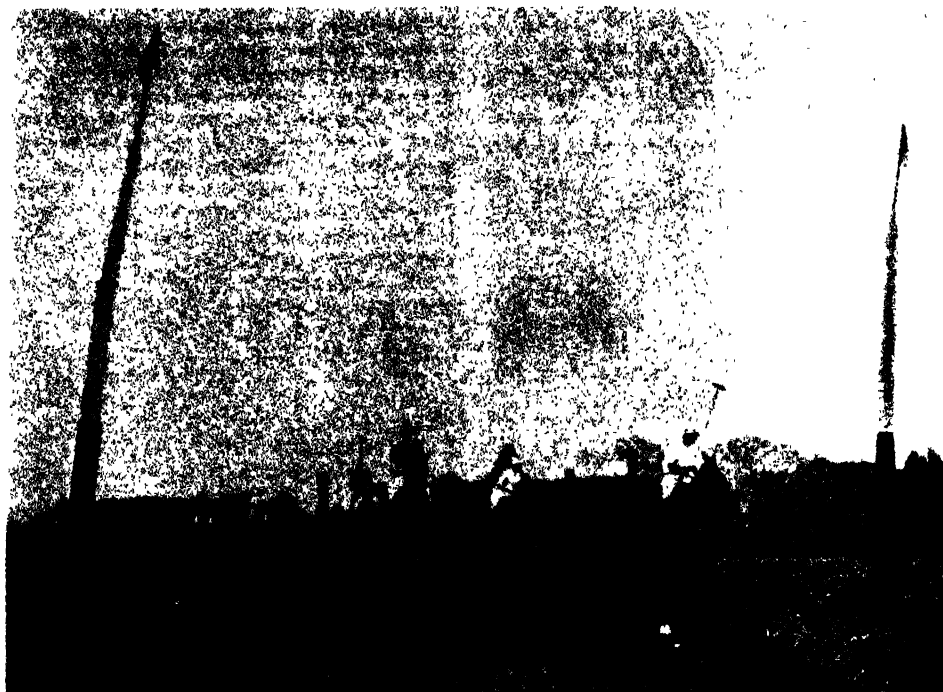
night, such as some varieties of honeysuckles and petunias, are pollinated by night moths; and those which are most fragrant in the sunlight attract day-flying bees and butterflies. Other flowers, such as the violet, in which the nectar is deeply hidden in the corolla, cannot be pollinated



POLO

A fast movement during play. No. 1 (left) is riding for the goal whilst the opposing back is attempting to intercept.

Photo: U. & U.



SCORING A GOAL AT POLO

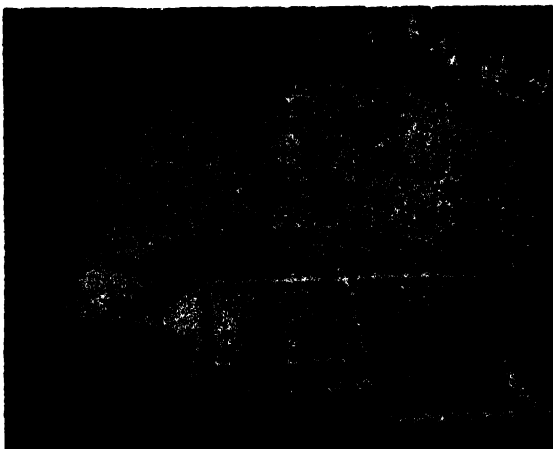
Photo: Photopress

POLO. A ball game played on a grass-covered field by men on horseback. In its rules it is very much like hockey (which see). Two opposing teams, usually of four men each, endeavour to drive the ball through their opponents' goal posts. A full-sized regulation field is 900 ft. long and 480 ft. wide if boarded at the sides, 600 ft. wide if without boards; the posts, which are made of light wood or papier mâché, so that they will break easily in case of collision, are placed 24 ft. apart, and the goals must be at least 750 ft. from each other. The players use white willow balls $3\frac{1}{2}$ in. in diameter and $4\frac{1}{2}$ oz. to $4\frac{3}{4}$ oz. in weight,

and cane or rattan mallets from 50 to 56 in. in length. At one end of the mallet is a cigar-shaped piece of hard wood; a lightweight leather strap or tape at the other end is fastened about the wrist.

In starting the game, the men of each team are stationed so as to defend their respective

goals, the first two men playing forward, the third half back, and the fourth full back. The game in England is usually divided into seven periods of eight minutes each, called *chukkers*, from a Hindustani word; intervals of three minutes between periods being allowed for changing ponies. As polo is a fast and exciting game, the ponies



WATER POLO

Hungary versus the Argentine in the Olympic Games, 1928.

Central

are driven very hard, and can play but a short time without resting. The expense of training and keeping these animals makes the game, as a rule, a rich man's pastime, but it is a favourite game of cavalry officers.

It is thought that polo originated in Persia at least 2000 years ago, and spread throughout the Eastern countries and Europe. In England, India, etc., it has long been a high favourite among sports, and since 1876, when James Gordon Bennett introduced it into the United States, it has been steadily growing in favour with Americans.

Water Polo is a similar game played by swimmers, who use an air-filled ball that will float on water.

POLO, MARCO (*circa* 1250-1324). A medieval traveller who lived in Venice, and whose journeys in the East made him famous. He was the son of Nicolo and the nephew of Maffeo Polo, whose trade ventures led them into long journeys in the Orient. On one of these journeys they reached Cathay (China) and were cordially received at the court of the celebrated Kublai Khan. Returning to Venice in 1269, they set out again for Cathay two years later, and this time took the young Marco with them. The Mongol ruler received them with even greater marks of favour, and appointed Marco to various offices of importance, which made it possible for him to become acquainted with different parts of the realm. Indeed, so greatly did Kublai appreciate the society of the Europeans that he was loath to allow them to depart, and only with great reluctance gave his consent to their accompanying an embassy to Persia, which set out in 1292.

In 1295 the Polos reached Venice again, and in the next year, Marco took part in a war between his native city and Genoa, in the course of which he was taken prisoner. During his confinement, he dictated in French to a fellow prisoner the story of his travels, which was published as the *Book of Marco Polo*. This created a wide sensation, and for centuries was the source of European knowledge about the Orient. Most of its statements were looked upon as fiction or exaggeration, but later explorations showed Marco Polo to have possessed keenness of observation and an accurate memory.

POLONIUM, *pō lō' nium*. An element, or form of radium, found in pitchblende.

POLTAVA, *pōl tah' va*, BATTLE OF. See CHARLES XII (Sweden).

POLYANDRY, *pōl i an' dri*. See POLYGAMY.

POLYANTHUS. This may be either a hybrid between the cowslip and primrose or a cultivated form of oxlip. The varieties produce flowers of many colours in the early spring. The umbel-shaped clusters

grow on a single stem. These plants make delightful borders and thrive in rock gardens when planted in a mixture of loam, leaf mould and sand. They can be raised from seed or by division of roots. *Polyanthus* Miller's Giant produces large flowers ranging in colour from white to crimson, and *Polyanthus* Orange King bears deep orange, bronze-edged flowers. *Polyanthus* *Narcissus* (*Narcissus* *Tazetta*) is cultivated in a similar manner to the ordinary *Narcissus*.

Scientific Name. The *Polyanthus* is of the natural order *Primulaceae*. It is *Primula vulgaris elatior*.

POLYBIUS, *pōlib' ius* (about 204-122 B.C.). An eminent Greek historian. While still a young man, he held important political positions in his native city of Megalopolis in Arcadia, but after the conquest of Macedonia in 168 B.C., he was taken with other young noblemen to Rome as a hostage. There he became intimately acquainted with Scipio Africanus the Younger, and accompanied him on his expeditions to Spain and Africa. Later, he rendered valuable service to his native country by helping to procure favourable terms for the government of Greece under Rome. He is, however, chiefly noted for his *Histories*, of which five of the forty books have come down to us entire, together with numerous fragments of the remainder of the work. The history as a whole treated of the growth of the Roman Empire from 220 to 146 B.C.

POLYCARP (*circa* 69-155). Bishop of Smyrna, and a Christian martyr. As a child he was taught by the Apostles, notably John. This early contact with John, and his later friendship with the youth Irenaeus, who became Bishop of Lyons and one of the leading Church Fathers of the West, makes Polycarp the living link between the Apostolic age and crystallized Catholicism. His period was possibly the most perilous in the history of the Church, and Polycarp's struggle against the revival of paganism, and his faithful transmission of the Apostolic tradition, assisted in the preservation of the Christian ideal.

The little we know of him comes from the writings of Irenaeus and Eusebius, and the anonymous *Martyrdom of Polycarp*. The only extant work of his own is the *Epistle to the Philippians*. When at the age of 86 the Roman government at Smyrna condemned him to death by burning, he refused to save his life by reviling Christ, saying, "Four-score and six years have I been His servant, and He hath done me no wrong. How then can I blaspheme my King who hath saved me?"

POLYCRATES, *pōl ik' rā tees*. A tyrant of Samos, who lived in the sixth century B.C. He made himself ruler of Samos c. 535 B.C..

compelled other islands to pay tribute to him, and conquered some of the provinces of Asia Minor. Herodotus tells that the Egyptian King Amasis, an ally of Polycrates, implored him to sacrifice to the gods some possession which he valued highly, lest they take away his good fortune. Accordingly, Polycrates threw into the sea a ring of great worth, which the next day was found in the belly of a fish that had been presented to him. Looking upon this as a sign that the gods would not accept the sacrifice, Amasis broke the alliance. About 522 B.C., a Persian ruler of Sardis invited Polycrates to visit him, and on his arrival had him put to death.

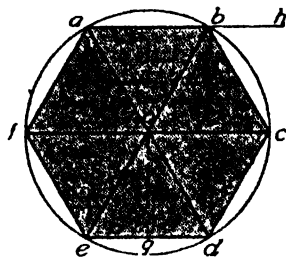
POLYGAMY, *pol'ig'ami*. A system of marriage by which a man has more than one wife at one time. The word is from Greek for "many marriages," and in its widest sense includes *polyandry* also, the term denoting the system of one wife for many husbands. From earliest times to the present, the taking of more than one wife has been common among various races, though never the only form of the marriage relation. It was not forbidden among the ancient Greeks, but was seldom practised, and it gained almost no hold among the Romans. The Britons practised it, but it was very rare among the early Germans, a fact which the Roman historian Tacitus found worthy of note.

In Oriental countries, polygamy is often a lawful practice. Mohammedans may have four wives, but among them, as among other peoples who approve of polygamy, the custom really obtains only among the wealthy classes, for the poor man cannot support more than one wife. Among the Hindus there are no restrictions as to number. Chinese law permits of but one wife. In Turkey, polygamy was abolished by the laws enacted in 1925 by the National Assembly, which enforced the registration of marriages, and empowered the President to grant divorces.

The ancient Jewish law permitted polygamy as well as concubinage. Christianity, however, has always strongly opposed it, and laws against it exist in all Christian countries. In the United States, the Mormons practised polygamy until 1890, when Congress passed laws forbidding plural marriages.

POLYGON. If five or more points in a plane, no three of which are in a straight line, are joined in order by straight lines, the resulting figure is called a *polygon*. The lines are called the *sides*; the sum of the sides is the *perimeter*. The angles formed by the sides are the *angles* of the polygon, and the meeting-points of the sides are the *vertices* of the figure. A polygon, in the

generally accepted sense, is a pentagon, hexagon, heptagon, octagon, etc., according as the sides number five, six, seven, eight, etc. If all the sides are equal, the polygon is *equilateral*. If all the interior angles are equal, the polygon is *equiangular*. The angles inside the per-



POLYGON

imeter are called the *interior* angles. If the sides are extended, they form other angles lying outside the polygon, which are called the *exterior* angles.

In the figure the angle *a b c* is an interior angle; the angle *h b c* is an exterior angle.

The sum of the interior angles of a triangle is 180° , or two right angles. The sum of the interior angles of a quadrilateral is 360° , or four right angles. The sum of the interior angles of any polygon is the number of sides minus 2, times two right angles.

POLYHYMNIA, *pol'i him'nia*. One of the Muses (which see).

POLYNESIA, *pol'i ne'shia*. See PACIFIC ISLANDS.

POLYNICES, *pol'i nī'sez*. In Greek legend, son of Oedipus, king of Thebes, and brother of Eteocles. When Oedipus was driven into exile (see OLDIPUS), Polynices and Eteocles agreed to share the throne, each in turn ruling for a year. Eteocles, however, at the end of his term, refused to give place to his brother. Polynices thereupon sought the help of Adrastus of Argos, and, with five others, they marched to attack Eteocles—the "War of the Seven against Thebes." The brothers killed each other, and the other five heroes fell in the fight, Adrastus being the sole survivor. The legend is told in Homer's *Iliad*, as well as by Aeschylus, Sophocles and Euripides.

POLYP, *pol'ip*. A name applied to a certain type of marine invertebrate. The characteristic polyp structure is a hollow, cylindrical body. At one end is a mouth-opening with a circle of tentacles which reach out to gather food, while small cells within the body digest it. The polyp attaches itself to stones at the bottom of streams or of the sea. The fresh-water hydra and sea anemone are examples of simple polyps; the coral is a compound form. See COELENTERATA.

POLYPHEMUS, *pol'i fe'mus*. A son of Poseidon, he was one of the Cyclopes who lived on the island of Sicily. All day he

wandered about with his flocks, which at night he drove into a huge cave where he lived alone. Odysseus and his companions were cast ashore on the island during their voyaging; at once they were captured by the giant and shut up in his cave to be devoured. Four were eaten, and then Odysseus with his remaining comrades, having made the giant drunk, blinded him by plunging a heated stick into his one great eye. Mad with rage and pain, Polyphemus stationed himself at the entrance of the cave that no one might escape, but Odysseus and his companions, by tying sheep together in threes and concealing themselves beneath them, passed out in safety.

POLYPODIUM, *pol' i pó' dium*, or **POLYPODY** The largest genus of ferns, a number of species of which are found in Britain. Ferns of this family have, as a rule, creeping rootstocks and clustered fronds. Best known of the species are the Wall Fern (*P. vulgare*), the graceful Oak Fern (*P. dryopteris*), and the evergreen Beech Fern (*P. phegopteris*). The cultivated varieties among the finest of garden ferns, flourish in moist soil containing leaf-mould.

POLYTECHNICS. This is the general name for institutions formed primarily in order to give vocational education, and secondarily in order to provide suitable outlets for the social instincts. The pioneer in this country, and the pattern adopted in many countries abroad, was the Regent Street Polytechnic. This institution, originating in a night school for ragged urchins, is now recognized as one of the finest products of the Victorian age. The various polytechnics provide educational facilities in all manner of occupational subjects, cooking and hairdressing, dressmaking and engineering in all branches, accountancy and banking and insurance. In many of the polytechnics an imposing amount of work for university degrees takes place. In England the polytechnics are recognized by the Board of Education as fulfilling a necessary function in adult education; they are regularly inspected and reported upon, they receive substantial grants, and are accordingly able to afford education, even of advanced character, at almost negligible fees. The number of young people of every type taking advantage of these chances for further education is great and growing. The evening work of the polytechnics is their specific and noteworthy contribution to the educational activities of the country; those denied the privilege of university life find there a substitute, not inadequate. The day-work, however, is growing rapidly.

POLYTHEISM, *pol' i the i' z'm* (Greek, "many gods"). The distribution of a faith and worship among several gods; as opposed to *monotheism*, the belief in and worship of one God. The feeling of dependence and the inclination to worship are natural to man; hence people living under primitive conditions are easily induced to worship familiar objects or forces that inspire admiration or awe. One of the most primitive forms is that of *Animism*, or the endowment of inanimate objects, e.g. stones, with a soul or life force which, if not propitiated, could injure the man who neglected to do homage. It is easy to see how such a religion would provide an explanation of otherwise unaccountable natural disturbances and accidents for people living close to nature.

Usually polytheism has consisted in the worship of the elements, of the stars, and of fire. In more civilized communities it took special form from the traditions and relative civilization of each nationality. Among the Greeks and Romans polytheism was not animistic, but the gods personified the heavens, the lower world, the elements, agriculture, art, etc. In the later ages the practice of religion was only formal. Commonly a religion such as this, arising from a vague fear of offending capricious spirits, became an increasing burden to those who practised it, as it developed the form known as *fetichism* (which see).

POLYZOA, *pol' i zo' a* See ZOOLOGY

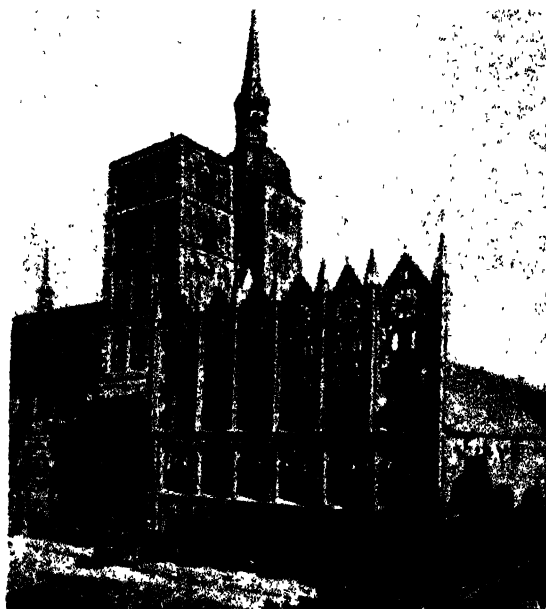
POMADE, *pom' ad'* Hair-dressing made of grease or oil which has been clarified. A commonly used pomade is made by melting together pure vaseline and sweet almond oil, which can then be perfumed if desired. Care must be taken that the ingredients of a pomade are absolute pure.

POMEGRANATE, *pom' gran' at* The fruit of a tree widely cultivated in the tropics and sub-tropical regions, and found wild in Western Asia and North-Western India.



POMEGRANATE
Showing also cross-section.
Photo: Visual Education Service

Though bush-like when wild, under cultivation the plant is trained to grow as a tree. It reaches a height of 15 to 25 ft. and bears numerous slender branches, at the ends of which appear the large, scarlet flowers. The



STRALSUND, POMERANIA

The Town Hall and Church of St. Nicholas, built in the fourteenth century.

Photo: German State Railways

fruit, which has a hard rind and looks something like an orange, is of a deep golden-red colour. It is filled with numerous seeds, each enclosed in a layer of crimson pulp having a pleasant, refreshing taste.

As a fruit the pomegranate is not popular. The pulp is used to make cooling drinks, in Mexico a fiery spirit is distilled from it; and in Persia it is made into wine. The rind contains a large amount of tannin. The pomegranate was familiar to the Hebrews in Bible times. In classical mythology, Persephone, Pluto's wife, was forced to spend six months of each year in Hades because she had eaten six seeds of the pomegranate while with Pluto in the nether world.

Classification. The botanical name of the pomegranate is *Punica granatum*.

POMERANIA, officially **POMMERN**. A Prussian province in northern Germany, lying along the Baltic Sea. It has an area of 11,986 sq. miles and a population (1933) of 1,919,935. The chief river is the Oder, on the banks of which is the city of Stettin (population 279,747), the capital and commercial centre of the province. Stralsund (population 40,000), in the shelter of Rügen

Island, was an important Hanseatic port. Sassnitz on Rügen is the port for the train ferry to Malmö in Sweden.

There are many lakes found in this region. Pomerania is for the most part a flat farming country, which produces good crops of rye, oats, wheat, barley, potatoes, beets, and tobacco. Shipbuilding, glass-making, sugar-refining, brewing, distilling, and the manufacture of tobacco products, woollen goods, and machinery are the chief industries of the towns. Politically the province is divided into three districts—Stettin, Köslin, and Stralsund.

Pomerania was first occupied by the Vandals, but in the fifth and sixth centuries, the Slavic Wends came, remaining until 1637. By the Treaty of Westphalia in 1648, Brandenburg gained the greater part of Farther Pomerania, and the remainder went to Sweden. In 1720 Prussia was given part of Swedish Pomerania, and in 1815 the remainder.

POMERANIAN. In build and appearance the pomeranian is a compact, well-knit, gay little dog, exhibiting great intelligence in his expression and activity and buoyancy in his deportment. The head is foxy in outline, the skull large in

proportion to the muzzle, the ears carried perfectly erect.

There are two coats, the one a soft, fluffy undercoat, the other a long, perfectly straight coat, harsh in texture and covering the whole of the body, being very abundant round the neck and forepart of the shoulders and chest, forming a frill. The hair on the head and face is smooth and short. The straight forelegs and thighs are well feathered. One of the characteristics of the breed is the tail, which is turned over the back and carried flat and straight, being profusely covered with long, harsh, spreading hair. In grooming, the coat is always brushed from the tail towards the head, the comb used as



POMERANIAN

Photo: Felli

little as possible, and then only with great care.

There are many delightful colours—white, black, brown, blue, orange, beaver, cream, as well as parti-coloured dogs.

Pre-eminent as a house dog, and easily trained, he is inclined to be noisy and to bark unnecessarily unless seriously taken in hand as a puppy.

Although now he may be as little as 3 lb. (4 to 6 lb. is the most desirable weight), at one time he was quite a large dog, and was used in Germany for herding sheep.

POMONA, *po mo' na*. The Roman goddess of fruit and flowers.

POMPADOUR, *pom' pa door*, JEANNE ANTOINETTE POISSON, MARQUISE DE (1721-1764). A mistress of Louis XV of France.



MADAME DE POMPADOUR
Photo: Brown Bros.

She was of lowly birth, but had received an excellent education. In 1741 she married Le Normant d'Etioles, and five years later, after the monarch had met her at a masked ball, went to live in Versailles as the King's mistress. She was given the title of Marquise de Pompadour.

She soon began to mix in politics, allying herself with the party until then in opposition, so that the ministers looked to her as their protectress. As an illustration of her power, it was through her that in the Seven Years War, France became allied with Austria, its traditional enemy. Her influ-

ence over the king, which was very great, she kept after his love for her had cooled, for she proved herself ready and able to provide him with entertainments and the riotous dissipation for which he craved.

POMPEII, *pom pay' e*. An ancient city of Italy which disappeared following the tragic eruption of Mount Vesuvius in A.D. 79. Its restoration, after burial for almost two

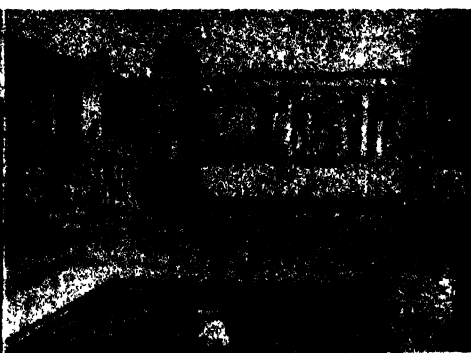


GATEWAY TO THE COURTS OF JUSTICE, POMPEII
The three stones set in the roadway are to prevent the passage of chariots.

Photo: OROC

thousand years under a blanket of cinders, pumice stone, and ashes, is bringing to light much of value to history and archaeology.

There was nothing very remarkable about Pompeii, yet it has become far more widely known than many of the more prosperous and wealthy Roman towns. It lay on a plateau of ancient lava at the mouth of the Sarnus River near the Bay of Naples, less than a mile from the foot of Mount Vesuvius. Founded in the sixth century B.C., the city had become a Roman colony 159 years



POMPEII
Street corner (left) and the House of the Faun.
Photos: E.N.I.T.

before the tragedy which ended not only its own existence, but that of two nearby cities, Stabiae and Herculaneum.

Pompeii was built in the form of an oval about two miles in circumference, and was surrounded by a wall pierced by eight gates. The streets, which regularly crossed at right angles, were paved with blocks of basaltic lava, in which may be seen the ruts made

wet ashes and of cinders, which, on drying, thoroughly sealed up the place. Its buildings, therefore, have been brought to light in a remarkable state of preservation.

The eruption changed the entire geography of the region. It turned the river back from its course and raised the sea beach, so that there was no way of locating the former site of Pompeii. For nearly seventeen centuries



RUINS OF A MANSION OF POMPEII

The villa of Marco Olconio as revealed by excavation. Vesuvius is seen in the background.

Photo. Keystone

by the wheels that passed over those thoroughfares centuries ago. In the centre of the city was the open square, or forum, typical of Roman cities, and surrounded by a group of important buildings. There were also a few theatres, a gladiators' court, numerous temples, and several large and sumptuously equipped public baths. The city enjoyed a prosperous trade in wine, oil, and other agricultural produce.

Though Vesuvius had given warning in A.D. 63, the Pompeiians regarded it as extinct. In midsummer of the year 79, a severe eruption buried Pompeii under 12 or 15 ft. of lava and stones. Of a population of about 20,000, almost 2,000 perished. In addition to the lava, there were showers of

it lay buried until gradually its very name was almost forgotten. Then in 1748 a peasant digging in a vineyard near Naples struck a wall. This resulted in extensive excavations in the region, and from that time, the work of recovery has been carried on according to a systematic plan, by the Italian government.

Over half of Pompeii has been unearthed. Foremost among the centres which have been brought to light are the forum and its surrounding buildings, the Temple of Jupiter (itself a ruin at the time of the eruption), the basilica, or town hall, and the temples of Apollo and of Fortuna Augusta. A considerable part of the city wall has been uncovered, as have a large number of private homes,



TEMPLE OF APOLLO, POMPEII
The magnificence of the building is indicated by the ruins unearthed by excavation. The statue of the god is in bronze, the basin is marble.

which afford interesting glimpses of the social customs of that day.

Many thousands of objects, including statues and articles used in the daily life of Pompeii, are preserved in the National Museum at Naples, about 13 miles distant. See **HERCULANEUM**; **PLINY**.

POMPEY (106-48 B.C.). The common English form of the name of **GNAEUS POMPEIUS MAGNUS**, the great Roman general and a member of the first Triumvirate. His first military training was received under his father in the war against the Italian allies, but he first did real personal service by his aid to Sulla in 83 B.C. By his own efforts he raised three legions and defeated the armies of Marius in Italy, winning thus the command against the party of Marius in Africa and in Sicily. Victorious in both places, he received a triumph on his return to Rome.

When Lepidus attempted to overthrow the constitutions of Sulla, Pompey effectually opposed him, and in 76 B.C. was sent to Spain, where the party of Marius was still very strong. Pompey could make no headway at first, but after the murder of the leader Sertorius, he overcame all opposition, and on his return to Rome, in 71 B.C., was given the rank of consul, with Crassus as his colleague. Meanwhile the aristocratic party

had come to look upon him with doubt because he seemed to be influenced by popular demands, and he proved the justice of their suspicions by restoring the office of tribune of the people. His military powers could not be denied, however, and in 67 B.C., he was entrusted with the task of freeing the Mediterranean of pirates. This difficult task he accomplished in forty days. The next

year he was placed in command in the Mithridatic War.

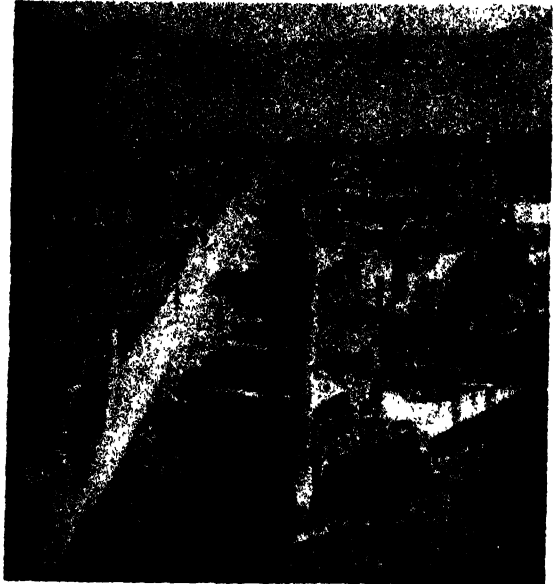
Pompey brought that struggle to a close, subduing Pontus, Armenia, and Syria, and capturing Jerusalem. The Senate, however,

still mistrusted him and refused to ratify his conduct of affairs in Asia, and in order to advance his interests, he formed a coalition with Julius Caesar. Crassus, with whom Pompey had quarrelled, was also reconciled and brought into the alliance, which thus became the famous First Triumvirate.

Pompey was married to Caesar's daughter Julia, and the two promised to respect each other's ambitions, but Pompey grew jealous of Caesar's ever-increasing fame, and, after Julia's death, induced the Senate, now more afraid of Caesar than of him, to demand that Caesar relinquish his command, but this the latter refused to do unless Pompey should resign his offices. Pompey in his turn refused, and Caesar, who was on a campaign in the north, promptly crossed the Rubicon and marched on Rome.

Fleeing to Thessaly, Pompey was completely defeated by Caesar at Pharsalia, and escaped to Egypt; but as he was landing from his boat, he was assassinated. His head was afterward presented to Caesar, who refused to look upon it and ordered the murderer's death.

PONDICHERRY. On the east coast of India, 83 miles south of Madras; the chief French possession in India and the residence of the Governor of French India. It has an area of 115 sq. miles, and a population of 123,555, mainly of Dravidian stock. The port itself has 43,499 inhabitants. Rice,



POMPEII

General view of the excavations.

Photo: E.N.I.T.



BUST OF POMPEY

Photo: Visual Education Service

manioc and ground nuts are grown, and there are several cotton-mills and oil presses. - The other French colonies in India are Karikal, Chandernagore, Mahé and Yanam, which together have an area of 81 sq. miles and a total population of 102,855. The colonies are represented in Paris by one Senator and one Deputy. The French settled at Pondicherry in 1674, were dispossessed by the Dutch, and regained control in 1697. The town was taken by the English four times between 1761 and 1803, but after each occasion it was returned to the French, the last time being in 1816.

POND-WEED. An aquatic annual plant, growing either on the surface of water or below. The stems are cellular, and the leaves thin and pellucid. It bears small greenish flowers, resembling arrow-grasses, in June and July. About twenty varieties are said to be native to Britain. *Potamogeton* flowers grow in cylindrical spikes, rising to the surface of the water. *P. densus* is opposite-leaved, and grows entirely submersed.

Scientific Names. Pond-weed belongs to the natural order of *Naiadaceae*. Floating pond-weed is *Potamogeton natans*; the horned pond-weed is *Zannichellia palustris*.

PONTIFEX, *pon' ti fex*. The title borne by each of the members of the sacred society of ancient Rome, known as the College of Pontiffs. At the head of the college was the *pontifex maximus*, an official who held office for life and could not leave Italy. (The name means, in Latin, "bridge-builder.")

PONTIFEX MAXIMUS. The title of the Pope, as head of the Roman Catholic Church.

PONTINE MARSHES. See ITALY.

PONTIUS PILATE. See PILATE.

PONTOON. A word derived from Latin *pons*, a bridge.

In every army there is a division of engineers whose special work is the construction of temporary bridges. Such a bridge may consist of a roadway of timber laid across a line of floating supports called *pontoons*.

Pontoons may be flat-bottomed boats of steel, wood or zinc or of canvas or metal



LAYING A PONTOON BRIDGE ACROSS THE MEDWAY AT WOULDHAM

Photo: Photopress

containers. In the British Army, bridging is carried out by Field Company, R.E., whilst the stores for bridging are held by the Field Park Company and Field Bridging Park. The work of bridging a stream is done with great rapidity, for in time of peace, bridging detachments of armies practise all forms of bridge-making, whilst the stores for making the roadway, resting on the pontoons, are all cut to fit exactly.

The engineers lay the flooring section by section, fastening it securely to the pontoons, which are placed side by side a few feet apart. Each pontoon has an upstream anchor, and at least every other one a downstream anchor as well.

Pontoon bridges are made by two methods—either by constructing the whole bridge close to the shore and swinging it into position with the current, or by *booming out*.

Booming out consists in adding pontoons and roadway at the shore end, whilst the outstream end is pushed further and further out until it reaches the far bank.

A river with a swift current is unsuitable for this form of bridging, owing to the strain on pontoons and anchors. In the British Army, pontoons are being replaced largely by folding boats.

PONTUS. The ancient name of a region in the north-eastern part of Asia Minor, bordering on the Black Sea. Originally, Pontus was a part of Assyria, but in the fourth century B.C., it was formed into a separate kingdom and rose to power under Mithridates the Great (135–63 B.C.). Pontus was conquered in 65 B.C. by Pompey, and under the Romans was an important point in their advance toward the Euphrates.

PONTUS EUXINUS, *pon' tus ūk' sin us.* The ancient name of the Black Sea (which see).

PONTYPRIDD. See GLAMORGANSHIRE

PONY. See HORSE

POODLE. Of very ancient breed, the poodle was imported into England from France towards the close of the nineteenth century. By those who do not know him, he is often regarded as a lop and a freak, but this opinion is based solely upon the effect produced by the method of trimming fashionable for the breed.

Not only is he an excellent retriever and guard, outstanding in obedience tests and a clever performer of tricks on and off the stage, but he makes a delightful companion.

He is an active and elegant-looking dog, well-built and carrying himself proudly, the head and muzzle long, gums and lips black, ears hanging close to the face, and neck well-proportioned and strong to admit of the head being carried high and with dignity.

The coat should be very profuse, of hard

texture, and of even length—the colour black, white, red, blue or brown. If the coat is not clipped but treated with brush and comb, it becomes very long and densely frizzy. If not groomed, the coat gradually "cords," i.e. the single hairs twist together



POODLE
Photo Fall

and become heavy, strong cords. This is far from desirable in the house dog, for on account of the difficulty in grooming the corded poodle is almost invariably smelly.

The Miniature Poodle is a small sized replica of the larger variety, and is a dainty hardy little fellow. He must be under 15 in at the shoulder.

POOL. A form of billiards for which specially coloured balls are required, each player having a different colour. After having selected his colour, each player attempts to pocket one of the balls already on the table and if he succeeds, continues to play until all the balls have been pocketed. The colours are played in the following order, white, red, yellow, green, brown, blue, and pink. The stakes are pooled, the whole falling to the winner who succeeds in pocketing the last ball.

POOLE. A "town and county," this is situated at the south-eastern extremity of Dorset, with an area of 17,861 acres and a population of 57,258 in 1931. Included within its boundaries are Hamworthy, Branksome Park, the Canford Cliffs, Parkstone, Sandbanks, Broadstone, and Canford Magna, and it is contiguous with Bournemouth on the east.

Commercially Poole owes its importance to its situation around the splendid anchorage of Poole Harbour. Recently considerable improvements have been effected in increased wharfage and in reclamation of the mud flats to accommodate new industries

The principal imports are coal, timber, oil, and cement, whilst the principal export is the Dorset china clay which is raised in the neighbourhood. The harbour is also an important centre for private yachting. Brownsea Island, in the centre of the harbour, is the traditional spot which Canute used as a treasure house after his punitive expeditions into Dorset. The castle is a modern mansion on the site of a Tudor fortification.

The borough is of ancient foundation, and the site of Hamworthy is established to have been a Roman station, usually identified with Moronio. As early as the beginning of the thirteenth century the harbourage was well known, and there was a growing township which soon became the chief port of the county. It was twice burnt by foreign invaders—once in the second half of the fourteenth century at the hands of the French, and again in 1406 at the hands of the combined Spanish and French forces. In 1568 a charter was granted whereby Poole became a county of a town, with separate

and again in 1933 when Broadstone and Canford were added.

A number of half-timbered houses have survived, notably the "King Charles Inn."



POOLE QUAY
Photo. Frith

The "old town house" is the medieval town hall, parts of which date from the fourteenth century. The Parish Church of St James was opened in 1820, but the site was once occupied by a church since Norman times.

POONA. See INDIA

POOR CLARES. An order of Franciscan nuns, devoted chiefly to the care of poor children.

POOR LAWS. Those laws which provide for institutional relief in kind, or outdoor relief in kind or money, to the necessitous poor, known now in Britain as "Public Assistance." Historically the British problem of poverty can be traced back to the decay of the Feudal system. In Saxon times every peasant was required to possess a home of his own or to live in the house of another who would shelter him; the manorial control of Norman Feudalism achieved the same result, but the thirteenth century practice of commuting feudal services paved the way for widespread poverty, followed by vagrancy and crime. Early legislation, the first Act of which was that of 1388, was directed merely against vagabondage; no effort was made to provide work for the able-bodied or relief for the impotent. Later Acts were even more ferocious in their penalties for vagrancy. The problem was intensified by the unemployment caused by enclosures or sheep-farming, which turned arable into pasture. A period of poor harvests from 1527 to 1536, followed in 1539 by the Dissolution of the Monasteries (which had afforded shelter to the destitute), brought matters to a head. In 1536, curates had been



"HARBER'S TILES"
An old street in Poole.
Photo. Poole Corporation

jurisdiction from the county of Dorset. The boundaries were enlarged in 1835, when Hamworthy and Parkstone were added, and again in 1905, when Branksome was included

asked to exhort their parishioners to help the poor, and in 1551 two collectors were appointed in each parish to dispense alms.

The year 1562 was a landmark in poor law development; poor relief was made a public charge. Compulsory assessments were made when voluntary methods failed. In 1572, overseers of the poor were appointed. In 1597 the churchwardens were made *ex-officio* overseers and were authorized to acquire materials to set the poor to work. In 1601 was passed the famous "43rd Elizabeth" by which the overseers assessed the inhabitants and, with the funds, set the unemployed to work and gave relief to the impotent. It also evolved the principle of the family's responsibility for maintaining its poor members where possible—a principle of law which remains to-day. Parishes were protected in 1662 by the Law of Settlement, which gave the parish authorities forty days to remove to their appropriate parish new arrivals who were likely to become a public charge.

The "workhouse" was first introduced in Bristol in 1697 and was intended to make the poor who were housed there self-supporting. Although the experiment failed, it introduced the principle of the "workhouse test," which gave the overseers power to refuse relief unless the applicant entered the "house." In 1782 "Gilbert's Act" made provision for the amalgamation of parishes into Unions, with a joint workhouse to which the aged and infirm were to be sent; outdoor relief only being given to the able-bodied. The Poor Law Amendment Act, 1834, set up a Board of Guardians for each Union, central control being exercised by the Poor Law Commissioners, whose work was taken over by the Local Government Board in 1871. In 1910 the newly-formed Ministry of Health became the central authority for poor law administration. The Poor Law Commission, 1909, was appointed to examine the weaknesses of the existing system, and out of their proposals there came many improvements. Old-age pensions and National Health Insurance were instituted to relieve the pressure on the Guardians, who were finally abolished when the Local Government Act, 1929, made the county councils and county borough councils the authorities for Public Assistance. Central control is rigidly maintained by the Ministry of Health, which issues codes of administration.

The heavy call on Public Assistance authorities by those able-bodied unemployed who had exhausted their insurance benefits has been transferred by the Unemployment Act, 1934, to a central body—the Unemployment Assistance Board—who grant relief after a means test.

POPE (Late Latin *papa*, father). The name given to the Bishop of Rome, the father or spiritual ruler of the Roman Catholic Church, which great organization regards him as its visible head, Christ being the invisible head. The office of Pope was founded on the words of Christ: "And I say also unto thee, That thou art Peter [from *petra*, "a rock,"] and upon this rock I will build my Church; and the gates of hell shall not prevail against it" (Matthew xvi. 18). The attention of every historian has been attracted by the endurance of the Papacy through centuries that have seen the downfall of every other European institution that existed when the Papacy arose, and of a number of others that have originated and fallen while it continued to flourish. The Roman Catholic offers these facts among others as evidence that the Church is not merely a human institution, but that it is built "upon a rock," despite the human weaknesses that have manifested themselves with the changes of time. The government of the Pope in spiritual matters is supreme, and through the power vested in him and the divine assistance claimed for him as the successor of Saint Peter, his teachings in doctrinal matters when he speaks *ex cathedra*, that is, in discharge of his office, are accepted by Catholics as infallible.

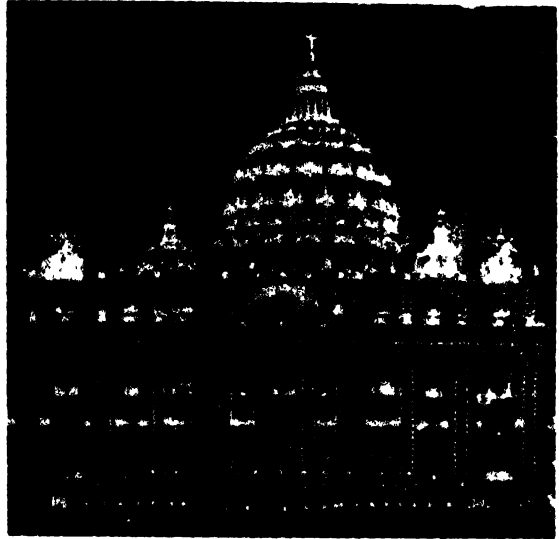
Insignia of Office. The Pope ordinarily wears the garb of the other bishops, but this is always white in colour; his shoes alone are different, being low, open shoes, red in colour, with a cross embroidered on the front. He wears out-of-doors a low, broad-brimmed hat. The tiara, the pontifical headdress, is used only in procession. His liturgical vestments are those of the bishops, except that the cope has a clasp ornamented with precious jewels, and for headdress he wears the mitre. The pontifical ring and the cross of gold, containing a relic of the true Cross, constitute his jewels. He is addressed as "Your Holiness."

Election of the Pope. The Pope is elected by a two-thirds vote of all the cardinals, who assemble as the College of Cardinals especially for that purpose. This elective assembly is called the Conclave. Their number (not more than seventy) varies according to different Papal appointments. Cloistered in a room which is made absolutely secure from intrusion and outside influence, they remain for hours or days, as need be, previous to the election, seeking divine assistance, through prayer, asking for the guiding light to direct them in their choice. The smoke issuing from the ballot papers, burned with straw in the Sistine Chapel after the election, proclaims to the excited crowds waiting outside that a choice has been made. The elected

candidate is clothed with the white Papal soutane in the sacristy of the Sistine Chapel, and receives the homage of the cardinals. Upon his accession the Pope assumes a new name. Owing to the geographical position of Rome, and the fact that Italian cardinals have usually been in the majority, the Popes for centuries have been Italians. The last one of foreign birth was Adrian VI, of Utrecht, who was elected in 1522.

Vicissitudes of Papal Power. The date of Peter's first appearance in Rome is disputed, but critics quite generally agree that he was there in A.D. 64, when the Christian community was already established, and that he built a church and suffered martyrdom there in the time of Nero. During the fourth and fifth centuries, the Roman Primacy was enhanced in power, and definite recognition of its spiritual supremacy was manifested when Leo the Great from 440 to 461, endeavoured to preserve the Greek Church from the degeneracy into which it had fallen. During the next 300 years, the Papacy carried through one of the most extensive tasks ever undertaken by an historic institution, that of spreading its faith among the Anglo-Saxons, the Visigoths, the Franks, and the Lombards. About this time the Benedictine Order of monks was founded,

Peter's Church, crowned Charlemagne Emperor of the West, pagan Rome lost its influence in the world. The Popes now claimed the right to crown the emperors, but



ST. PETER'S, ROME

It is illuminated when the canonization of a saint or other important event is celebrated.

Photo Photopress

the latter in turn asserted the right to confirm the election of the Popes.

The power of the Papacy gradually increased. However, in its power, the condition of the Papacy reflected the evils of the times; it became spiritually weakened by corrupt administration and disorders in elections, and by the sale of bishoprics and Church property for personal gain. Church officers became the vassals of lay lords, consequently, it is not surprising that men were appointed to the Papacy merely in the interest of their rulers. These practices were checked when Otto the Great in 962 was crowned emperor. In the middle of the eleventh century, Pope Nicholas instituted the College of Cardinals, which was to choose the Pope, the choice to be confirmed by the emperor and approved by the clergy and laity.

Gregory I (590 to 604) had insisted on the celibacy of the clergy and suppressed simony (buying and selling of ecclesiastical offices), thereby accomplishing much for the spiritual elevation of the Papacy. The Middle Ages



THE POPE'S PRIVATE AUDIENCE ROOM

Photo: Keystone

and they initiated the work of evangelizing Europe, at the same time preserving also the knowledge of classical times. In 800, when Leo III, on Christmas Day in St.

saw the prolonged struggle between the Popes, anxious to liberate the Church in Germany from lay interference in the investiture of bishops, and the Emperors, bent on possessing complete authority in Germany, Italy, and Rome itself over bishops and barons alike as their feudal subjects. When in 1076 the Emperor Henry II made a penitential journey on foot to the Castle of Canossa, waiting there three days in the

was truly pope. The Council of Constance restored order by the election of Martin V in 1417. The Protestant Reformation, begun a century later by Luther as a reform within the Church, ended in a Protestant denial of the dogmatic and moral teachings of the Church. An official reform from within came with the Council of Trent (1545-1563), but the medieval unity had been destroyed.

The temporal sovereignty of the Pope was



PALACE OF THE POPES, AVIGNON

Begun by John XXII in 1316, it was completed under Urban V in 1370.

Photo U. & U.

snow for Gregory VII's forgiveness, it seemed that the Papal cause had triumphed. During the pontificate of Innocent III (1198-1216), nearly every European ruler submitted to the sovereignty of the Church.

But presently there fell one of the heaviest blows to the temporal and spiritual power of the Pope—the removal of the Papal court from Rome to Avignon in 1305 by Clement V, when the "seventy years captivity" began. During this period, all the Popes were French and subservient to French interests, which greatly diminished Papal prestige. The return of the Popes to Rome was the beginning of the Great Schism of the West: at one time, three laid claim to the papal throne, and even the politically unbiased could not decide who

for a time nullified when Napoleon Bonaparte annexed the Papal States in 1797. However, by the Treaty of Vienna (1815) the States were restored to the Papacy under the protection of Austria. But during the struggle for the unification of Italy (1848-1870), all the landed possessions of the Papacy were confiscated, marking the end of the Austrian hegemony, and for sixty years, beginning with Pius IX, who ruled the Church from 1846 to 1878, the Popes remained voluntary prisoners in the Vatican, until their lands should be returned to them.

Leo XIII and his successors followed a policy of extension and consolidation of Papal authority, which increased the spiritual power of the Papacy.

In 1929 an agreement of utmost historic importance was reached between the Italian Fascist government and Pius XI, who became Pope in 1922. A settlement of the dispute of sixty years' standing is found in two documents—the treaty, which has international value, and the Concordat, which is national in scope and concerns only relations between the Vatican and the Italian state. By the terms of the treaty, the sovereignty of the Pope over a small area of Rome, called



GARDENS OF THE VATICAN PALACE

Photo: Topical

Vatican City, was recognized. See VATICAN CITY.

The income of the Pope is derived from the voluntary contributions of the faithful, known as "Peter's pence."

Antipope. An ecclesiastic elected, or claiming to have been chosen as Pope, in opposition to the Pope regularly or canonically chosen. For political reasons, sometimes for religious reasons, certain factions in the Roman Catholic Church, or certain European rulers, opposed the authority of the Pope and supported an antipope against him. In the days when the Pope had temporal as well as spiritual authority, political considerations often played the most important part in the election of the Supreme Pontiff. Otto I, Holy Roman Emperor, displaced two Popes for personal reasons; later emperors used military force to displace Popes, or set up antipopes; the kings of France frequently interfered, and even the kings of Sicily, a comparatively unimportant kingdom, sometimes set up antipopes in opposition to the Popes supported by the emperors.

The first antipope usually noted was Laurentius, elected in 498 in opposition to Symmachus, and the last was Felix V, a Duke of Savoy, who was elected in 1439. The most famous of the antipopes was elected after the death of Gregory XI in 1378. Gregory was a Frenchman, but he removed the Papal See from Avignon back to Rome, where the cardinals proceeded to elect an Italian, Urban VI, as Pope. Shortly afterward, the French cardinals elected the antipope Clement VII, a Frenchman, who was recognized as Pope by France and Spain, while Italy, Germany, and the whole north of Europe except Scotland, supported Urban. This rivalry produced the Great Schism, or Schism of the West, which divided the Church for half a century.

POPE, ALEXANDER (1688–1744). The most eminent English poet of the eighteenth century. With Steele, Addison, Swift, and Defoe, he contributed to that period a literary excellence that has given it the name Augustan Age. Pope was born in London, of a Roman Catholic family. Because of his religion, his education was acquired in private schools and from tutors. Much of his learning, however, was the result of his own unaided and unsystematic study of languages and literature. He was unusually precocious, and composed an *Ode to Solitude* when but twelve years old. In 1719, having fully made up his mind to devote himself to poetry, which had always been first among his interests, he went with his mother to live in a villa at Twickenham, where the rest of his life was spent.



ALEXANDER POPE

Pope is one of the most unusual of literary personalities. A hunchback from early childhood, and keenly sensitive to criticism, he was frequently driven to retaliate upon those who had stirred up his envy or hatred. Recent criticism has done much to restore Pope's reputation as a man by showing how frequently in the course of his life he met with unprovoked attacks from the wretched scribblers of his day. He was, however, capable of real loyalty to his friends, among whom were numbered such men as Swift, Gay, and Arbuthnot. His love of fame always drove him relentlessly, and most of his acts were dictated by it. As a poet he has been variously ranked by critics. In his own age his worth was overestimated,

admirers declaring him the greatest of all English poets; in the following Age of Romanticism, he was as much underestimated. Certainly his polished couplets, though they produce the effect of monotony and artificiality, have done much to make excellence of form a necessity of verse. Pope is much quoted—more, perhaps, than any other English poet except Shakespeare.

His earliest work, the *Pastorals*, published in 1709, but written when he was still in his 'teens, was almost as perfect in technique as anything he wrote later. The *Pastorals* were followed by the *Essay on Criticism* (1711), in which the standards of literary judgment are set forth in elegant, flowing verse, and *The Rape of the Lock* (1712 and 1714), a mock-heroic epic, filled with sprightly humour and bright fancy and enlivened by the introduction of sylphs who control the development of the plot. In 1717 he published a collected edition of his poems, which included the *Epistle of Eloisa to Abelard* and the *Elegy on an Unfortunate Lady*. The most profitable of his undertakings from a money point of view was the translation of the *Iliad* and the *Odyssey*, the latter largely the work of assistants. Though excellent in themselves, these translations fail to preserve the simplicity of the original poems. Following these came (in prose) *Bathos, or the Art of Sinking in Poetry*, and the famous *Dunciad*, both directed against critics and adversaries, and both bitter as only Pope knew how to be. The fourth book of the *Dunciad* was not written till 1743, and Pope revised the whole poem in the following year, substituting for his original hero, Lewis Theobald, the poet laureate, Colley Cibber. Pope's last works were the *Moral Essays*, including the much-quoted *Essay on Man*, and the excellent satires called *Imitations from Horace*. With the present reaction from nineteenth-century romanticism, his reputation is steadily increasing.

POPE-FISH. A fish also known as the Ruffe, this small member of the perch



POPE-FISH
Photo: Waller

tribe is widely distributed throughout northern Europe. It is common in some

rivers of southern England, haunting deep waters and feeding voraciously on small insect life, crustacea, etc. Anglers regard the pope-fish as a nuisance, since it greedily takes baits intended for other fish. It reaches a length of 5 or 6 in.

Scientific Name. *Acerina vulgaris*.

POPLAR. A well-known hardy deciduous tree of the genus *Populus* and natural order *Salicaceae*, to which also belong the willows.



BLACK POPLAR
Photo: E. J. Hosking

There are many species of poplars which are natives of Europe, Asia and North America, three, the white (*P. alba*), black (*P. nigra*), and Aspen (*P. tremula*) being indigenous to Great Britain. The trees have a grey smooth bark and alternate leaves, the unisexual, wind-pollinated flowers appearing in hanging catkins, usually before the leaves. They grow best in deep moist loam near running water, but not where the soil is marshy. Being quick-growing, the poplars are suitable as screens, and owing to their graceful tapering or pyramidal form they are cultivated as ornamental trees. The wood of the black poplar is soft, light and whitish-coloured, fine-grained and with a silky lustre. Being easily worked, though not strong or durable, it is used in carving, making packing-cases, and for charcoal. The White Poplar (*P. alba*),



POPPY FIELD IN FLANDERS
Photo U. and V.

or Abele, grows to a height of 60 to 100 ft. The Black Poplar (*P. nigra*) is a smaller



LOMBARDY POPLAR
Photo: E. J. Hoeking

tree, while the Aspen (*P. tremula*) is distinguished by its quivering leaves. In addition to these native species a number of foreign poplars are grown as ornamental trees, such as the Lombardy Poplar (*P. italica*), having a pyramidal habit; the Balsam Poplar (*P. balsamifera*) with a tapering, pointed form; and the Canadian Poplar (*P. canadensis*), the cottonwood of America.

POPLIN. A fine-ribbed fabric of cotton, silk, wool, cotton and silk, silk and wool, or wool and cotton. It derives its name (*popeline* in French) from the fact that it was first

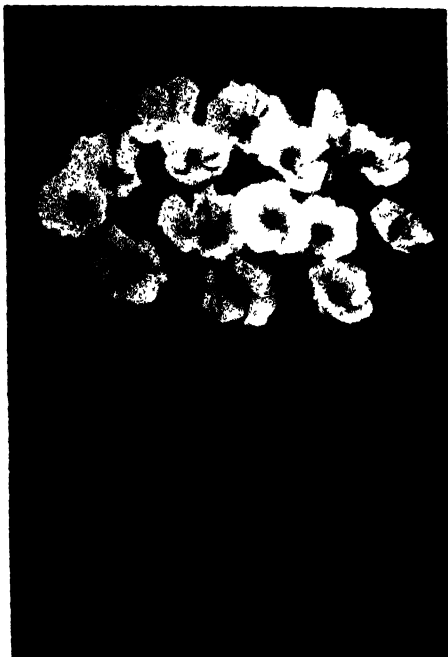
made at Avignon, the seat of the Popes from 1305 to 1378. The more common modern poplins of good quality add to the silk warp a worsted weft which gives the cloth softness and substance. The worsted filling, being much heavier than the warp, gives the cloth a cross-wise corded effect.

POPOCATEPETL, *po po kah' lay pet'l*. A dormant volcano in Mexico, about forty miles south-east of Mexico City, 17,881 ft. in height.

POPPY. The common name of a genus of flowering plants whose most important member, from the commercial point of view, is the white poppy of China, India and Persia. This species is extensively grown in the Orient for the opium obtained from the milky juice of the young capsule. See **ORIUM**.

The best known of Western species is, however, the red poppy which grows wild

in the grainfields and grassy meadows of Great Britain and the continent of Europe. The *Iceland poppy* is native to North America; its flowers, in various shades of yellow, rose-pink, and scarlet, last longer than most of these short-lived blossoms. The most showy of all species is the large-flowered *Oriental poppy*, whose red-orange blossoms have conspicuous blackish-purple centres.



ORIENTAL POPPY
Photo: Sutton & Sons

Under cultivation, numerous variations in the size and form of the blossoms have been brought about. The brilliant Shirley poppies are favourite annuals. The plants are hardy and are easy to cultivate. The juices of the garden varieties have no narcotic properties. For the Californian Poppy, see **ESCHSCHOLZIA**.

Scientific Names. The poppy family is *Papaveraceae*. The opium poppy is *Papaver somniferum*; the red poppy, *P. rhoeas*; the Iceland, *P. nudicaule*; the Oriental, *P. orientale*.

POPULATION. During the early part of the nineteenth century, controversy, provoked by the *Essay on Population* of Malthus, raged furiously round the problem of over-population. Some who were entranced with the rapidly increasing power of man over Nature thought that the golden age was approaching. Malthus, on the other hand, feared that the population would

grow to such an extent that there would not be enough food to go round.

Population, Malthus taught, is constantly pressing close upon the heels of subsistence; and the possibility of greater food supplies gives a relief that can only be temporary. For, whatever be the causes by which population is anywhere limited to a comparatively slow rate of increase, there is always an immense residuary power behind, ready to start into activity as soon as the pressure which restrained it is taken off.

The echoes of this controversy are with us yet. There is over-population among us, assert some. Unemployment is a proof of this. To-day, the trouble is that the working classes have outgrown the demand for their services as attendants on the machines, that now seem to be rivals rather than co-operators with labour. Against this contention we have the vehement assertions of others, that transport facilities and the possibility of economic co-operation with other countries have radically altered this problem of over-population. The "population laws" of Malthus were a deduction from the conditions of his time: they have no application now.

There are no rigid "laws of population." Such "over-population" as appears results from the institutions established in a community. Alter those institutions, and "over-population" disappears. It is forcibly argued that there is, taking the world as a unit, no lack of capacity to produce: the dread of a shortage of food has for ever vanished. What is lacking is better distribution of the means to purchase the things produced. Too great a volume of saving—a diversion from wages to capital—results in the displacement of workers. There is a consequent concentration of income, and a progressive "technological unemployment." The many without work suggest "over-population." With more equal distribution of purchasing power, there would be no lack of consumers for all the goods that industry can produce. Unemployment would vanish and with it any suggestion of "over-population."

Population adjustments frequently create grave national and international problems, as well as moral problems. The belief that a country is over-populated, in an economic sense, has caused, in some instances, a deliberate and voluntary decline in the birth-rate among the people inhabiting that country. Other countries, peopled by fertile races, have become obsessed by the necessity of finding outlets for their increasing numbers. Prior to 1914, migration could always be relied upon to ease the situation in countries which were becoming thickly

peopled, but in recent times migration, for a variety of reasons, has almost ceased.

The most densely populated parts of the world are Belgium, Holland, England, Japan, China and some parts of India. Germany and Italy are also fairly thickly peopled, and it is because these two countries, together with Japan, have believed that they required new territories for their peoples, that international politics have within the last few years become so acute. Population problems were among the factors that led to Japan's action in Manchuria and to Italy's invasion of Ethiopia.

In some parts of Great Britain there is the problem of "surplus" population. There is a steady drift of industry from the North to the South-east of England, leaving idle large numbers of workers for whom the State has to make special arrangements.

PORCELAIN, *por's'layn*. The name applied to those varieties of pottery that



PORCELAIN FINISHING OFF THE DECORATION
Photo U. & U.

are glazed. Porcelain is made from a variety of clay called *kaolin* and feldspar, or from clay containing a small amount of silica. The



IN ROYAL GERMAN PORCELAIN WORKS
The Royal Prussian Porcelain Manufactory was founded in 1750 by Frederick the Great.
U. & U.

PORCELAINS *from* MANY LANDS



HOLSTEIN - HOLLAND



SPODE ENGLAND



CHELSEA
TEA POT -
ENGLAND



BOWL - AUSTRIA



SEVRES
EWER
FRANCE



BOWL -
PERSIA



SOMETSUKE
PLATE
JAPAN



BOWL CLOISONNE
JAPAN



DELT BLUE HOLLAND



BELLEEK
AMERICA



PISA WARE
ITALY



BELLEEK
IRELAND



PAPER
WEIGHT
CHINA



MILK JUG - SPAIN



COFFEE POT -
ITALY



JAR -
CHINA
(MING DYNASTY)



EWER -
ENGLAND

processes of manufacture are the same as those employed in making other varieties of pottery. The Chinese invented porcelain, and it is from this fact that porcelain is called *china*, or *chinaware*. They are known to have manufactured it as early as 1000 B.C., and they still continue to make the most delicate ware.

The manufacture of porcelain was introduced into Europe in 1709, when a factory was established at Dresden by royal decree. This was the beginning of

the manufacture of the famous Dresden china (which see).

Classes of porcelain known respectively as hard and soft porcelain are recognized in trade. Many beautiful articles of soft

porcelain are on the market, but they are less delicate than those of hard porcelain.

Sèvres Porcelain. A celebrated grade of hard porcelain has been manufactured at Sèvres, France, for over a century. Rich



VASE SHOWING JAPANESE INFLUENCE

Photo: Royal Copenhagen Porcelain Co.



MODERN PIECES IN PORCELAIN

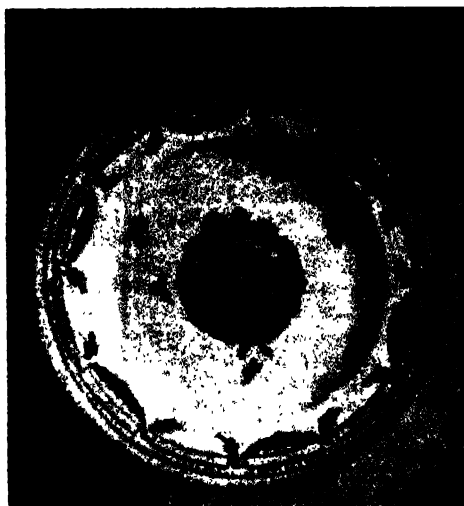
Photo: Royal Copenhagen Porcelain Co.

gilding and enamelling and elaborate ornamentation characterize this porcelain. Among the productions are vases 5 ft. or 6 ft. high, plaques decorated with paintings copied from well-known pictures, and figures and groups modelled by eminent sculptors. The town is situated 7 miles south-west of Paris. Its porcelain factory is owned by the government, and there is, besides, a public museum with specimens showing the historic development of the porcelain industry.

Derivation. The word *porcelain* is from the Italian *porcellana*, "cowrie"; the latter is the name of a shell bearing a close resemblance to the white glazed surface of this ware. See POTTERY.

PORCH. An exterior structure forming the approach to a building. The word has acquired different associations. "Porch" or "Portico" is sometimes used as the designation of the colonnade or hall where courts of justice are held, especially in the East. Perhaps the most famous porch was the Painted Porch—Stoa Poikile—at the Agora in Athens, where Zeno and his disciples held their discourses, and from the word "Stoa" is derived the term "Stoic" in the philosophic sense.

PORCUPINE, *por' kû pine*. A rodent found in the forests of both hemispheres, whose chief peculiarity is the possession of strong, stiff quills, with which, in the American species, are mixed long coarse hairs. The name *porcupine* comes from the French for "spiny pig." These quills are the animal's principal means of defence, for, unlike



PORCELAIN PLATE, 1780-90

This beautiful piece has a saw edge. It is decorated with flower garlands and a sleeping Cupid in the centre of a wreath of forget-me-nots.

Photo: Royal Copenhagen Porcelain Co.

squirrels, rabbits, rats, and other rodents, porcupines are slow-moving and dull-witted. Ordinarily, the quills lie down smoothly, but when the animal is excited, they stand sharply erect. The spines come out easily



PORCUPINE WITH YOUNG

Photo: Photopress

when touched, and as they are fitted with numerous small barbs that hold them in the flesh of the attacker, a porcupine is not an easy prey.

There are two main divisions of the porcupine family, inhabiting the forests of the



AFRICAN PORCUPINE

Photo: Cherry Kearton

Old World and the New World, respectively. The former live in burrows in the ground, and seek their food at night. The latter are mainly arboreal, smaller, and with longer tails. See HEDGEHOG.

Scientific Names. The porcupines of the Old World constitute the family *Hystricidae*; those of the New World, the family *Erethizontidae*. The European porcupine is *Hystris cristata*.

PORIFERA, *por'if'er a*. The "pore-bearers," a major division, or phylum, of the animal kingdom, constituting the lowest group of many-celled animals. This division is made up wholly of the sponges. See SPONGE; ZOOLOGY.

PORK. The flesh of swine, used extensively as food. The different portions of the animal's carcass furnish varieties of meat which

have special names. The flesh along the backbone (the chine) and on the ribs, corresponding to the loin in lamb and veal, is used for roasts, steaks and chops. Hams come from the thigh; the flesh on the shoulders is also prepared in the same manner as ham. The flank, directly below the ribs, furnishes bacon. The trimmings of both the lean and the fat meat are used in making sausages.

Pork contains a larger percentage of fat than any other meat, and is therefore a superior fuel food. Fat salt pork has a fuel value of 3555 calories per pound; the value of medium pork chops is 1530 calories. Pork is thus an excellent food for cold weather, but should be eaten sparingly in summer. It lends itself to curing much more satisfactorily than either beef or mutton, and its flavour grows richer and more delicate with the passage of time.

In Biblical times the pig was regarded as an unclean animal, and the eating of its flesh was forbidden by the Mosaic law. This prejudice was not confined to the Jews alone, but extended to the Arabians and Egyptians.

PORPHYRY, *por'fe re*. The name *porphyry*, or rather *porphyrites*, means "purple," and was given by the ancients to a certain rock from Jebel Dhokan, in Egypt, which was much esteemed as an ornamental stone. This rock had a very characteristic appearance, owing to the inclusion of many small white crystals in a dense reddish ground mass. Later, the name "porphyry" was applied by geologists to all rocks, regardless of colour, which contained larger crystals of some mineral scattered through a fine-grained ground mass. There are many kinds of porphyry, but all of them are igneous, some form dikes, and some were poured out upon the surface of the earth as lava.

PORPOISE, *por'pus*. A sea mammal belonging to the same order as the dolphins and the whales (see CETACEA). The best-known species is the common porpoise of the northern hemisphere. It is from 6 ft. to 8 ft. long, and is covered with a smooth, hairless skin, black on the upper part of the body, and white below. It has a short, beakless muzzle, and a blowhole placed between its eyes; its jaws are provided with from forty to fifty teeth each. This porpoise is a relentless hunter of herring, mackerel, and salmon. Porpoises swim high in the water with their shiny backs visible above the waves. Porpoise flesh is not popular as food, but a fatty layer beneath the skin yields fine lubricating oil. A good quality of leather is obtained by cutting down the thick skin of the animal. The porpoises lack the beak-like snout of the true dolphin; though they are often confused



FEEDING A PORPOISE
Photo: Weller

with them. They frequent bays and estuaries rather than the open sea.

Scientific Name. Porpoises belong to the family *Delphinidae*. The common species is *Phocaena phocaena*.

PORSON, RICHARD (1759-1808). A celebrated classical scholar, who became Professor of Greek at Cambridge. His fame, as frequently happens with scholars, rested less on anything that he had published than on his general reputation for learning. He edited four plays of Euripides.

PORT. Among various uses of the word "Port," as exemplified in port-hole, port wine, to port a helm, etc., by far the most important signification is that of a place on the sea-board of a country or on the banks of a waterway accessible from the sea, where operations connected with the loading and unloading of ships and the handling of goods are carried on. The word is not infrequently applied to any sheltered place which affords natural or artificial accommodation for shipping, as in the expression "any port in a storm," but this meaning is more appropriate to the word "harbour," and the two terms are not really synonymous. A port is essentially more than a harbour, in that it provides facilities for the loading and storage of goods and their dispatch, either inland or abroad. In this respect, it fulfils in a commercial sense the scope of the Latin word, *porta*, a gate. It is the gateway between land and sea, through which passes the stream of goods and commodities which constitutes the overseas trade of a country.

Accordingly, a port must provide a sheltered water area, with sufficient depth and convenient anchorage ground for shipping, with quays, wharves, transit sheds, cranes, and a variety of other structures and appli-

ances for the handling and reception of goods. Many ports are also equipped with special forms of enclosed accommodation for shipping called Docks (which see).

Ports may be classified according to their position as seaports, river ports, lake ports or canal ports, but the first of these terms is now generally taken to include all ports which are capable of receiving sea or ocean-going vessels, even though situated like London and Antwerp, some 50 miles, or like New Orleans, nearly a hundred miles from the open sea. In this way, a distinction is drawn between those ports which are frequented by important liners, requiring a deep navigable approach channel, and others which are served by the smaller and shallower type of craft navigating inland and coastal waters.

For the commercial prosperity of a port, it is essential that it should possess a favourable and well-developed "hinterland." This is the term applied to the region immediately behind, surrounding or otherwise associated with the port, in one or other of two ways and sometimes in both of them. On the one hand, a hinterland may be a source of mineral wealth, such as coalfields or mining districts, or it may be a region producing wheat or cotton, or oil, or manufactured goods in large quantities for dispatch abroad. On the other hand, it may be a "consuming" district, arising out of the need of a large population (as in the case of London), or of important industries requiring raw material (such as those of South-east Lancashire or the West Riding of Yorkshire). In any case, a port has to be fed with business by its hinterland, either in the form of demand or of supply.

Few, if any, countries are entirely self-supporting and most have to depend for sustenance, or industry, in some shape or form, on the activities of their ports. Among leading ports of the world are London, New York, Liverpool, Hong Kong, Montreal, Shanghai and Genoa, all with ocean trade normally in excess of £100,000,000 per annum. Additional leading ports in Great Britain are Hull, Manchester, Southampton, Glasgow, Newcastle, Bristol, and Cardiff.

A *free port* is a port, or confined area within a port, where goods liable to customs duty may be landed temporarily without payment of dues, pending re-export, or until conveyed outside the free port.

PORTAL VEIN. See BLOOD; LIVER.

PORT ARTHUR. An important city and naval station in Manchuria (which see)

PORT-AU-PRINCE, *port o pran's*. See HAITI.

PORTCULLIS, *port kul' is*. See CASTLE.

PORT DARWIN. Chief town in Northern Australia. See NORTHERN TERRITORY.

PORT ELIZABETH. See UNION OF SOUTH AFRICA.

PORTEOUS RIOTS, THE. In 1736 some stone-throwing occurred in Edinburgh at the hanging of Andrew Wilson, a popular smuggler, and Captain John Porteous ordered the City Guard to fire at the crowd, killing six citizens and wounding eleven. He was found guilty of murder by an indignant jury, and all Edinburgh felt its liberties slighted when he was reprieved by Queen Caroline, as Regent in the absence of George II. A curiously orderly mob broke into the Tolbooth at night and hanged Porteous on the scene of the shooting; they even left a guinea for compensation in the shop from which they took the rope. No evidence was later brought against the offenders, but the Lord Provost was dismissed and the city fined.

PORTER. A particular brew of beer, dark brown in colour, having been made from roasted malt, or from malt partly charred or dried at a high temperature. It has a richer flavour than beer, but is slightly bitter in taste. Most porters are rich in saccharine matter. It is believed that originally "porter" was a mixture of ale and stout, and it was supposed to have been a favourite drink with a low-class type of labourer in London, hence the name "porter" came to be given to what was formerly known as "Porters' ale" or "Porters' beer."

PORTER, WILLIAM SYDNEY (1867-1910)
An American author of short stories, best



W. S. PORTER
Photo - C. & U.

known to the reading public as O. HENRY. It was under this name that he wrote the humorous and realistic tales of the lives of everyday Americans, so widely read and appreciated, and in many ways unrivalled. In all "O. Henry" wrote about 200 short stories now collected under various titles. Among the best of

these collections are *The Four Million*, *The Trimmed Lamp*, *The Voice of the City*, *Cabbages and Kings*, *Options*, and *Waifs and Strays*.

PORTLAND CEMENT. See CEMENT.

PORTLAND, DUKES AND EARLS OF. Richard Weston (1577-1635) aided the naval reforms in 1618 and became Chancellor of the Exchequer in 1621. He tried to insert a clause saving the King's sovereign right

in the Petition of Right. In 1628 he became Lord Treasurer. An experienced minister with a pacific foreign policy, he kept the confidence of Charles I, who created him Earl of Portland in 1633.

Hans William Bentinck (1649-1709), of an ancient family of Guelderland, was page of honour and close friend to William of Orange, whom he accompanied to England in 1688. He commanded a Dutch regiment and was a Lieutenant-General at the Boyne, but his most important services were diplomatic. He plotted with the Whigs before the Revolution, represented William on occasions in Holland, and negotiated the Treaty of Ryswick and the treaties which sought to solve peaceably the Spanish Succession. He was first gentleman of the bedchamber to William, who created him Earl of Portland in 1689.

His son Henry was created Duke of Portland in 1716 and was succeeded by William, 2nd Duke, in 1726. William Henry Cavendish, 3rd Duke (1738-1809) succeeded in 1762. He was inevitably a Whig, and in 1782 Lord Rockingham appointed him Lord-Lieutenant of Ireland. In the next year he became Premier of a coalition (the real leaders of which were Lord North and Lord Fox), which was soon dismissed by George III. The excesses of the French Revolution made the "Old Whigs" join Pitt and the Tories in 1794. Portland became Home Secretary and in 1801 President of the Council, resigning in 1803. In 1807 he again became Premier, but was little more than a figure-head in a Cabinet that contained Castlereagh and Canning.

The family of Bentinck still enjoy the dukedom. Another illustrious member was Lord William Bentinck (1774-1840) 2nd son of the 3rd Duke, who, as Governor-General of India from 1827 to 1835, introduced legal and educational reforms, suppressed suttee and Thuggism, and settled the North-west Provinces.

PORTLAND, OREGON. The largest city of the state, situated 50 miles north of Salem, the state capital, and 183 miles south of Seattle. The city is an important seaport: the Columbia and Willamette rivers bear its ocean-going craft to and from the Pacific Ocean, 100 miles to the west. Population (1930) 301,815.

Portland marks the end of the famous Oregon Trail, now the scenic Columbia River Highway.

Portland is the terminus of four great transcontinental railways, the Great Northern, the Northern Pacific, the Southern Pacific, and the Union Pacific.

It is a great lumber-shipping port, and millions of feet of lumber are consumed in

the manufacture of pulp for the use of paper mills. Other outbound shipments include agricultural products, furniture and wool. In all, the city has over 1100 industrial plants. Hydro-electric power is derived from the Willamette Falls at Oregon City, 12 miles south-east of Portland.

PORT NATAL, na tal'. See DUREAN.

PORT OF LONDON AUTHORITY. The public authority responsible for the administration of the Port of London. It came into existence in March, 1909, under the terms of the Port of London Act, 1908. All the docks, covering over 4000 acres and hitherto privately owned, passed into the care of the new Authority. It has also taken over all the rights, powers, and duties of the Thames Conservancy Board below Teddington Lock—a stretch of 69 miles. The licensing of all lightermen (i.e. those who load and unload ships lying off the shore), at one time a function of the Watermen's Company, is now undertaken by the Authority which consists of 17 members elected by wharfingers, rivercraft owners, and payers of dues, and 10 appointed by the Admiralty, the Ministry of Transport, the London County Council, the City of London Corporation, and Trinity House, in addition to a chairman and a vice-chairman. It is responsible for an annual trade of about £500,000,000.

PORT OF SPAIN. See TRINIDAD.

PORTO RICO, re' ho. See PUERTO RICO.

PORT SAID, say id' See EGYPT

PORTSMOUTH. A city and County Borough, seaport and watering-place in the administrative county of Southampton; area, 7964 acres; population (1931) 249,288. It includes the popular holiday resort of Southsea, and the manufacturing centre of Portsea. The main industry centres upon the naval dockyard of Gosport, which is

said to be the largest in the world, with an area of nearly 300 acres. Other industries are those necessary for the provision of material for the fitting and shipbuilding yards, including engineering. It is intended to make Portsmouth a combined land and marine airport, among the world's largest.

The early history of Portsmouth is identified with that of Porchester, which was a port from the time of the Roman invasions. The town first became a borough in the beginning of the thirteenth century, and by the beginning of the sixteenth century had become the principal naval station in the country. A chain of forts surrounds the harbour and, together with those of Spithead and the Isle of Wight, makes up the most comprehensive fortifications of any port in England.

The most ancient building is the parish church, which was built in the twelfth century. The garrison church is only a little later in date; that also retains considerable architectural features of the period. The house in which George Villiers, Duke of Buckingham, stayed before the expedition to La Rochelle and where he was murdered has been restored. The round tower guarding the entrance to the harbour is on a site which was fortified as early as the Roman period, part of the original walls remaining.

Southsea has in recent years become one of the many holiday resorts of the south coast. It has two piers, a long beach, and picturesque gardens on what were formerly the barren wastes of Southsea Common.

PORTSMOUTH, LOUISE DE QUÉROX-AILLÉ, DUCHESS OF (1649-1734). The mistress of Charles II. She came to England from France as maid of honour in the suite of Princess Henrietta (sister of Charles) in 1670, and was thereupon naturalized. She



PORTSMOUTH

Left: Warship steaming past the round tower built in the reign of Edward III to defend the harbour.
Right: The Guildhall. Another illustration of Portsmouth is on page 3502

Photos: Portsmouth Corporation



SOUTHSEA PIER AND BEACH, PORTSMOUTH

Photo: Portsmouth Corporation

played an important part in the politics of the time, and endeavoured to keep Charles friendly to France, though he was too far-sighted a statesman to allow his amours to interfere with his foreign policy. Her descendants became Dukes of Richmond and Gordon.

PORTUGAL. A country which lies to the south-west of the Iberian peninsula. The area is 35,490 sq. miles, including the Azores and Madeira; that of continental Portugal is 34,254 sq. miles. The total population is 6,825,883, of which 465,536 are in the Azores and Madeira.

Emigration, which formerly was very extensive, has fallen off in recent years; it is chiefly to Brazil and the Argentine. Phœnician, Carthaginian, Roman, and Greek colonists and Gothic and Moorish invaders were the ancestors of the Portuguese of to-day.

Religion and Language. Until 1910, when the Republic was established, Roman Catholicism was the State religion. The Church has now been separated from the State, and all forms of worship are permitted; however, about 80 per cent of the people are Roman Catholics.

The Portuguese language is based on Latin **The Cities.** The chief of these are Lisbon, the capital, and Oporto.

Lisbon, *liz' bon*, officially *lehzh' boá*, the capital is situated on a low range of hills overlooking the Tagus River, about seven miles from the sea. The harbour is one of the finest in the world. The manufacture of gold and silver wares, cotton spinning and weaving and the canning of fish are no leading industries. Exports include wine, cork, fish, cattle, salt and fruits. The monastery (now used as an orphanage) and church of Belem, construction of which began in 1500, is the finest structure in the city: it is a monument to the great seamen of Portugal. The church of Estrella is a reduced copy of St. Peter's at Rome. The city has sometimes suffered from earthquakes, the most serious being in 1755. Population 594,390 (1930).

Oporto, officially *Porto*, a medieval city, and the seaport and chief industrial city, is next in size to Lisbon. Port wine, the principal export, takes its name from this town. Oporto is on the Douro, three miles from its mouth. It is encircled by pine-covered mountains.

Many of the old monasteries are still standing; one is a citadel, another is used as a barracks. Oporto has considerable commercial and industrial importance. Distilleries, sugar refineries, textile industries, preserved foods, etc., represent the main types of industry of the city. Population 232,280 (1930).

Physical Features and Climate. The coast of Portugal presents scenes of striking contrast, rising from marshes and sand dunes in the extreme north to steep, rugged cliffs farther south, then dropping again to sandy beaches, to rise to cliffs at Cape St. Vincent.

The interior is a succession of pine-covered hills and mountains, which are

tion and improvements turned the tide of tourists toward the Mediterranean shores in France and Italy. With an enlightened and stable government of some years standing, Portugal has improved in these respects, and is again becoming celebrated for its coast resorts. The heat in the valleys of the interior is often severe.

Rainfall is heaviest in November, December, and January, but is not confined to any one season.

Resources. Although the mountains of Portugal contain great mineral wealth, these natural resources are largely undeveloped, because transport is neither cheap nor adequate. Iron, next to coal, is the most



GOVERNMENT BUILDINGS, WHITE HORSE PLACE, LISBON

Photo: Fox

continuations, west and south-west, of the mountain ranges of Spain. Between these lie the valleys, in which are the fertile vineyards of Portugal. The Cantabrian Mountains cross the two northern provinces, their highest ranges being only 4800 and 4650 ft. high. The loftiest mountains in Portugal rise to 6540 ft. The mountain slopes, wooded with nearly 2,000,000 acres of pine, furnish the timber of Portuguese commerce. There are about 800,000 acres of cork trees, and a greater area of oaks.

Many swift tributary streams flow into the three great rivers—the Douro in the north, the Tagus in the central part, and the Guadiana in the south. The rivers are very important as commercial highways.

The climate is notably equable and temperate. The average temperature is 61°, with a difference of only 20° during the year. In the eighteenth century, Portugal was a famous winter resort, but the lack of sanita-

important mineral, and there are lead mines at Coimbra, copper is mined at San Domingo and other places, and wolfram or tungsten ore is of value.

The sunny hillsides and valleys are devoted chiefly to the cultivation of grapes. In the Douro valley, about 60 miles from Oporto, are grown the sweet, black grapes from which is made port wine of the very best quality, to the extent of 13,000,000 gallons a year. About 89,000,000 gallons of olive oil are produced annually. Mulberries are plentiful, and the vine-grower of the north also cultivates the silkworm. Agriculture has been neglected until recent years, and the peasants do not allow experiments to be made to check the ravages of pests. Maize is cultivated to a large extent in the north. Wheat, potatoes, rye, and oats are important crops, and rice is grown in the lowlands. The home production of cereals is now sufficient to supply the country's needs.

Onions, beans, and sumac are grown, and lemons, oranges, peaches, and Elvas plums are abundant in the south. The country's production of cork is next in importance to that of Spain, 70,000 tons being produced annually. Portugal is one of the few countries never visited by the cattle plague, and the beef is of excellent quality. About 41 per cent of the country is not available for

made. The total railway mileage is 2135, of which 824 are State-owned. Exports are chiefly fish, wines and cork, mainly to Great Britain, France, and Germany. The picturesque ox teams are still seen in rural districts and small towns.

Government. A Republic was declared in Portugal on 5th October, 1910. A provisional government was established which lasted



PRACA DE PEDRO, LISBON

Photo: Booth Line

cultivation. Fisheries are very important, especially as regards tunny and sardine of which quantities are tinned in oil for export. Setubal is the chief fishing port.

Manufactures. Portugal has fallen behind most European countries in the development of manufacturing industries. The potteries of Aveiro and the lace manufactures are losing their former reputation. However, textiles still hold first place in manufacturing industries, and the manufacture of *azulejos*, or porcelain tiles, continues to be one of the characteristic industries of Portugal.

Transport. In 1926 the largest railway company of the country took over the other government-owned lines, the second largest system, and many improvements in rolling stock and methods of construction were

until 20th August, 1911, when a constitution was adopted. A new constitution was promulgated in 1932. This provides for a legislative body of one chamber—the National Assembly of 90 members, elected for a term of four years. The President is elected by direct suffrage for seven years. A Privy Council of 10 assists the President. The new constitution was adopted in March, 1933.

Education. Primary education is compulsory, and is rigidly enforced in the cities. In 1911 a decree was promulgated defining the educational system. There are about 8200 elementary and more than thirty secondary schools, besides special colleges and the universities of Lisbon, Coimbra, and Oporto. In spite of these educational opportunities, more than half of the people over 10 years of age are unable to write.

Colonies. The Portuguese colonial empire is fourth in the world. Its population of 8,200,000 is 20 per cent greater than that of Portugal itself; its area is more than twenty-four times that of the Republic. The Azores archipelago and the island of Madeira are considered an integral part of the Republic under the home government. The Cape Verde Islands, 300 miles from the west coast of Africa, have a mixed Portuguese and negro population, and are of strategic and commercial importance. In Africa, Portuguese Guinea, a territory of about 14,000 sq. miles, was important in the days of the slave trade. Príncipe and São Thomé islands, off the coast of Africa, are very fertile and produce important revenues. Cacao plantations cover 125,000 acres, and this is the most valuable export; other products are coffee, rubber and cinchona. Other African possessions are Angola, on the west coast, and Mozambique, on the East African coast. The Asiatic dependencies are Daman, Diu and Goa, in India, and Macao in China. Under Dr. Monteiro as Foreign Minister, colonial finances were put on a sound basis in 1932-3, and development on modern lines has proceeded steadily. (See articles on the separate colonies.)

HISTORY

The first colonists came from Carthage and Phoenicia; later, Greek colonies were founded at the mouth of the Tagus, and during the Roman Empire, Latin settlements were made. Some historians have identified Portugal as ancient Lusitania. In the fifth century, the whole peninsula was overrun by the Visigoths, and in the eighth century Portugal was conquered by the Moors. The rule of the Moorish caliphs was wise, and the country prospered until the tenth century, when their power weakened. Centuries of fierce warfare between the Moors and Christians followed. Ferdinand the Great, of Castile, Leon, and Galicia, in a series of hard-fought battles, overcame the Moors, conquering Beira in 1055, and progressing south until in 1064 he had rounded out the territory as far as Coimbra. The districts were organized according to the feudal system as counties under Galicia, and a seaport near Oporto, the Roman *Portus Cale*, furnished the name for the new nation.

Burgundian Kings. Alphonso Henriques, son of Count Henry of Burgundy, a Christian Knight who joined in the fighting against the Moors, was the first King of Portugal. He extended the kingdom by repeated victories over the Moors, and in 1147 he made Lisbon his capital. Under Alfonso III (1248-1279), Portugal attained its European limits, Mo-

hammedan warfare was concluded, and the constitutional history began.

From 1279 to 1325, under Denis, peaceful progress succeeded warfare; the first commercial treaties with England were made; the navy was founded and schools were established. During the rule of the succeeding kings, Alfonso IV and Pedro I, the court had grown powerful and corrupt, and when



TRADERS AT THE QUAYSIDE, LISBON
Photo Fox

Ferdinand came to the throne in 1367, the monarchy had reached a crisis, but he overcame internal difficulties. At his death, John I was chosen king, and this new line is generally known as the House of Aviz. His son, Henry the Navigator, contributed materially to the fame of his father's reign. By 1420 Madeira had been rediscovered, and before King John's death, the Azores had been reached. Through the reigns of his three successors, Edward (1433-1438), Alfonso V (1438-1481), and John II (1481-1495), explorations and discoveries continued; Dias rounded the Cape of Good Hope in 1486.

A "glorious age" followed under Manoel "the Fortunate" (1495-1521), and two years after he took the throne, Vasco da Gama found the Cape route to India. In 1500 Brazil was added to Portugal's possessions through the discoveries of its sailors. Vasco

da Gama's voyage to India revolutionized the routes of trade, and Lisbon replaced Venice and Genoa in commercial supremacy. Europe now faced west and not east, and a new era began. This age of luxury, absolutism, and adventure was followed by a rapid decline and Portugal eventually came under Spanish control.

During the Spanish rule, the English, Dutch and French attacked the Portuguese colonies, and seized those in South America and in India. This condition had lasted sixty

out Peninsular War (which see) involved Spain and France; these were allied against Portugal, which later sought aid from Great Britain. Napoleon's Berlin Decree of 1806 attempted to close all continental ports to British trade—a provision which Portugal refused to sanction. The French occupied Lisbon, and set up a military government. Britain sent aid to Portugal under General Wellesley, who routed the French at the Battle of Vimiera in 1808. John VI, the former regent, who had fled to Brazil,



IN THE DOURO VALLEY

Loading a boat with barrels of port wine for transport. On the River Douro to the coast for export.

Photo Fox

years when the Duke of Braganza expelled the Spaniards, and was crowned king as John IV, the first King of the House of Braganza; this line continued in power until a Republic was proclaimed. The most picturesque time of Portugal's history ends with the beginning of the seventeenth century. The Treaty of Lisbon, 1668, settled the war with Spain, and Portugal was again recognized as independent. During the reigns of Alfonso VI, Pedro II, and John V, Portugal's foreign relations, especially those with England, were strengthened. The Methuen Treaty, made in 1703, by which England took Portuguese wines at a preferential rate, was not abandoned until 1836.

At the time of the French Revolution, Portugal was again drawn into war, through its alliance with England. The long-drawn-

returned to a people imbued with the idea of constitutional government. A democratic constitution was drawn up in 1822. In the same year Brazil declared its independence, a loss which so angered the army that it gave its support to the royal party led by Miguel, son of King John, who abrogated the constitution of 1822.

Growth of Republicanism: Downfall of the Monarchy. Miguel seized power in 1824, but he was before long driven into exile. At the death of John VI, his son Pedro became king as Pedro IV, and a Constitution providing for a bicameral legislature, and granting the fundamental liberties to the citizens, was promulgated in 1826.

After the death of John VI, a period of civil strife followed, and republican feeling was continually growing stronger. New



PORTUGAL

1. Oporto from the Bridge of Dom Luis. 2. Peasant girl in native costume. 3. Port wine arriving from the Douro Valley. 4. Fishwives. 5. A scene at the opening of the National Assembly (Parliament). 6. The Tower of Belem at the mouth of the Tagus. It is said to mark the starting point of Vasco da Gama's voyage. 7. Parade during the Harvest Celebration, in Lisbon. 8. Cintra, a view from Quinta Regalaria.

Photos: Sport and General. George Lang

constitutions were adopted, and during the reign of Pedro V (1853-1861), there was a great revival of national spirit. Railways, telegraphs, and the school system were improved and extended. As a result of the plague at Lisbon in 1861, in which the king died, sanitary reforms were accomplished.

When Luiz succeeded Pedro V in 1861, more changes in the government were necessary. Slavery was abolished in all Portuguese colonies in 1869, education was reformed, new railways were built, and the general economic condition of the country improved. King Luiz died in 1889, and was succeeded by his son Carlos. Extravagance and financial mismanagement increased the already enormous public debt. Serious uprisings and strikes aroused the country to protest against Franco, the Prime Minister, who had assumed a dictatorship. He was a man of impeccable integrity, who had the welfare of his country at heart, but his arbitrary decrees, which were upheld by the king, caused discontent, and ultimately resulted in the assassination of King Carlos and the Crown Prince on 2nd February, 1908.

Manoel II (1899-1932), the son of Carlos, tried to establish a representative government on a sound basis, but party struggles had become too bitter and politics were too corrupt. The Republican party gained a large majority, causing the fall of the monarchy in 1910. A provisional government was established, and the present Constitution was adopted one year later. Dr. Manoel, Arriaga became first President of the Republic, but for the next sixteen years no Ministry was in office for more than a few months.

The World War and Post-War Period. Portugal early showed its sympathies in the great conflict. Before the close of 1914, Portuguese troops attacked German colonies in Africa to protect their own possessions. On 9th March, 1916, Germany formally declared war on the Republic.

The period immediately following the World War was one of continued political disturbances. From the time the Republic was founded up to May, 1926, there were eighteen revolutions, and forty Presidential Cabinets were overthrown. The revolutionary movements during 1920 and 1922 became a customary political weapon.

The revolts of 1925 and 1926 were of a less violent nature, and indicated that the inclination of the army was to expel the politicians from power. General Carmona, after a bloodless revolution in 1926, became Premier and Minister of War in a new Cabinet which he selected, and by 29th November he assumed the Presidency. He continued as virtual dictator, but in 1928 secured his

position by an election, and gave it a legal status. The country owes much during the last few years to the wise government of the Premier, Dr. Salazar.

PORTUGUESE EAST AFRICA. Former name applied to Mozambique (which see).

PORTUGUESE GUINEA. A colony lying on the west coast of Africa, between the French possessions of Senegal and French Guinea. The area is 13,944 sq. miles, and the population is estimated at about 365,000. Bissagos Islands, off the coast, form a part of the colony. The capital is Bolama, on an island of that name in the delta of the Rio Grande, or Comba, it has a safe harbour, and with Bissau, the chief port, handles the commerce of the colony. Portuguese Guinea is an alluvial plain with a tropical climate that is oppressively hot and wet in summer and warm and dry in winter. The chief products are rubber, ivory, hides, oilseed, rice, millet and wax.

The territory is administered by a Portuguese governor and council, appointed at Lisbon; yet outside the trading stations, native life and government, where they existed, were until recently little disturbed by Portuguese authority. A small military force is maintained, including a majority of natives. Owing to the predominance of French colonies in the vicinity, most of the commerce is controlled by that nation. The inhabitants are of many negro tribes, each maintaining its own customs, religion and language, and they seldom mix or intermarry. The Portuguese inhabitants consist of officials, soldiers, and a few traders. Portuguese traders frequented this and other West African coasts as early as the fifteenth century, but Portugal made no territorial claim until late in the nineteenth century. Her claims to Guinea were recognized in 1890, after she had failed to substantiate her ambition in the Congo area and East Africa.

PORTUGUESE LITERATURE. The records of Portuguese literature before 1200 are scanty. But the thirteenth and fourteenth centuries are rich in various forms of literary composition comprising *cantigas* or songs, in which Provençal influence is so clearly marked, *romances* or chivalrous romances, and chronicles and lives of saints.

During the fifteenth century the Renaissance reached Portugal; the sonnet, ode and ottava rima were introduced from Italy, and Portuguese drama was created by Gil Vicente (c. 1465-1536?), whose plays show his lyrical and comic powers and the genius which enabled him to transfigure everything that he imitated. *The Lusads*, the great national epic poem, also belongs to this period.

The sixteenth century is important for its chronicles and books of travel, which were inspired by the adventures and discoveries of Portuguese travellers.

The popularity of the chronicle continued throughout the following century, and epic poetry and drama were also written. But the literature of the seventeenth century suffers from *Gongorism*, the name given to the affected and tortuous Latinized style (*estilo culto*) which characterizes the writings of the Spanish lyrical poet, Luis de Gongora (1561-1627).

A revival in Portuguese literature began in the first years of the eighteenth century. One sign of the revival was the founding of the *Academia Ulyssiponense*, a literary society to which several distinguished writers belonged who did much to improve the national literature.

This revival was but a prelude to the Romantic movement, which was led by the poet João Garrett (1799-1854) and the historian Alexandre Herculano (1810-1877). Garrett's collection of poems called *Folhas Caídas* and Herculano's *História de Portugal* are justly famous.

The novel has been practised very much by modern Portuguese writers. The impressionist Camillo Castello Branco has written some well-known novels, including *Amor de Sapaço* and *Amor de Perdição*. Eça de Queiroz and Gomes Coelho are also distinguished writers of modern Portuguese prose.

PORTUGUESE WEST AFRICA, OR ANGOLA. Lying between Belgian Congo and South-west Africa, it has an area of 470,712 sq. miles. From a low coastal plain the land rises steeply to the ancient plateau of Africa which reaches over 5000 ft. in the Bibe plateau and falls northward to the Congo basin and south-eastward to the Zambezi drainage. Temperatures are high, but modified by elevation; and with prevailing off-shore winds rainfall is low, so that savanna is the prevalent vegetation with forests on the wetter coast, near the Congo mouth. The colony includes the Kabinda enclave of equatorial forest, north of the Congo mouth. The population is estimated at 4,600,000, who are of Bantu negro races, there are 49,000 Europeans, chiefly Portuguese. The natives grow maize, manioc, ground-nuts and tobacco, and rear cattle; sugar, cotton, coffee and sisal are grown for export. Some rubber has been planted. Ivory is collected, salt and, recently, diamonds are exported, while copper, iron, gold and possibly oil occur. The present capital is São Paulo de Loanda (population, 40,000), the capital designate Nova Lisboa, situated 200 miles inland on the chief line of railway. This

begins at Benguela, on Lobito Bay, the best harbour of the province, runs inland for 600 miles to the Belgian mineral district of Katanga, and continues southward through Northern Rhodesia, whence a connection is being developed with Beira, in Mozambique. Farther south, Mossamedes has interests in sugar, cotton, and fish-curing and also a line to the interior. There are in all 1425 miles of railways and a growing mileage of motor roads. The colony is ruled by a High Commissioner. Portuguese mariners discovered the coast in the fifteenth century, and Portugal claimed the area in 1574, but for centuries had no real jurisdiction in the interior. The Dutch took Loanda in 1641 and held it for a time. For long, Angola was of value to Portugal chiefly for the export of slaves to Brazil, which decimated the population. In recent years, however, its fortunes have been reviving as economic development has advanced.

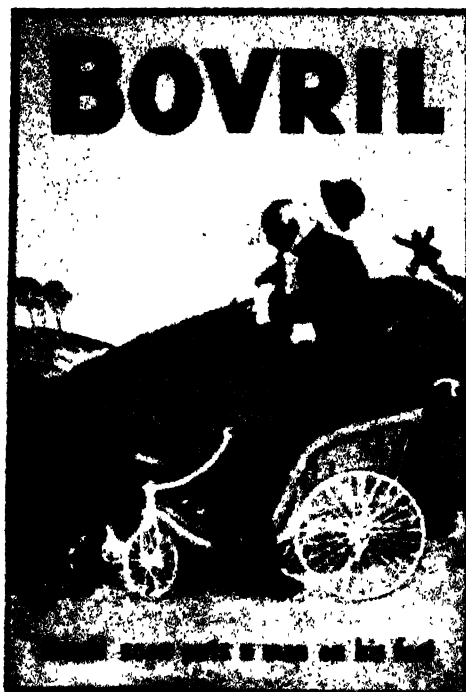
PORT WINE. A beverage made from grapes, officially and legally described as a "fortified wine, produced in the Douro region and exported through the bar of Oporto." Unless a wine answers to this description it cannot legally be sold as port. Vintage port is the wine of a selected year in which the grapes have ripened to perfection, tawny wine is a blend of wines of several years, and ruby port is a blend which contains a portion of vintage wine. Port wine is "fortified" by the addition of spirit to give it the strength required by exporters.

POSEIDON, *po si' don*. The name of a Greek god, identified by the Romans with Neptune (which see).

POSEN, *po' zen*. A county of the Republic of Poland, with an area of 10,242 sq. miles. Posen was formerly part of the old kingdom of Poland, but was taken by Germany in the Polish partition of 1795, and remained a province of Eastern Prussia until 1919. Its present status in the Polish Republic was fixed by the Treaty of Versailles. During the World War, Posen was invaded by the Russians, and was the scene of severe battles. The county has a population of 2,112,871 (1931). Most of the people are Poles of the Roman Catholic faith. The chief towns are Posen (Poznań), the former provincial capital, Gnesen, Bromberg, Hohensalza, and Schneidemühl.

Posen or Poznań, is situated in the centre of the eastern plain on the navigable River Warta, a tributary of the Oder. It is the centre of a fertile agricultural region. The chief trades are those connected with grain, wool, and cattle. Population 260,444 (1931).

POSTTIVISM. See COMTE.
POSTAGE STAMPS. See STAMPS.



MODERN POSTERS

Though robbed of the attraction of the bright colours which are a feature of lithographic reproduction, the designs shown have that essential of good posters—the power to attract and to interest.

POSTERS. Advertising by posters in England may be said to have originated when public announcements, theatre notices, etc., were made by sticking bills on the posts that stood along the chief London streets. At a later date, larger bills were printed and, to accommodate these, they were pasted on any blank walls or other available spaces, until such methods became a nuisance and the billposters were threatened with prosecution. The billposter then erected his own poster stations, and these have been considerably improved and increased in size since. The poster has proved a great success for certain types of advertising—those in which the whole message may be conveyed in a few seconds by the use of brief and simple wording and striking pictures or colouring. As a general rule all posters are 20 in. by 30 in. or a multiple of that size, the most popular size appearing to be what is called the 16-sheet upright (80 in. wide by 120 in. high). The poster stations or "advertisement hoardings" are owned by contractors and billposting firms, but the advertiser usually employs a service house to make all the necessary arrangements for poster publicity. Hoardings—"the poor man's picture galleries" as they have been called—are subject to regulations depending on the discretion of local authorities, and are, of course, also subject to the various legal enactments applicable to advertisements generally.

POST-GLACIAL PERIOD, OR RECENT PERIOD. See QUATERNARY PERIOD.

POST-IMPRESSIONISM. A movement in art which further developed the principles of Impressionism. Its tendency is classical rather than naturalistic, and stress is laid on architectural form and symbolism. The beginnings of Post Impressionism were seen in the work of Cézanne; its development was continued to some extent by Gauguin and Van Gogh; with Picasso it branched off into the vagaries of Cubism, and it became even more eccentric with the strange portrait productions, half human, half lay figures or carved columns, of the Surrealists. Its best qualities, however, have exerted a vital influence in modern art.

POST MORTEM. A term meaning "after death," denoting examination of a human body to ascertain the cause of death. Excepting in cases in which crime is suspected, a post mortem may not be made without the consent of the nearest relatives. See CORONER.

POST OFFICE. The British Post Office service took its rise in the system of relay posts. In 1482, during the war with Scotland, arrangements were made for the transmission of news by horsemen placed at

intervals of 20 miles. Under a royal right, citizens were compelled to lend horses for the purpose, and the controller of the whole arrangement was an officer of the King's household called the "Master of the Posts." This was the first post, and the earliest arrangement for a permanent "post" was on the Dover Road. In the time of Elizabeth



MOUNT PLEASANT SORTING OFFICE
Long Letter Sorting Department.
Photo: G. P. O.

a proclamation was issued ordering that no letters were to be sent to or from foreign countries except by the authorized posts, and this introduced an organized system. About 1600, fixed posts were set up to Ireland and Scotland, and twenty years later to Plymouth. In the reign of Charles I, Thomas Witherings was made "Postmaster of England for foreign parts," and he set up a service on six roads—Edinburgh, Holyhead, Plymouth, Bristol, Norwich, Dover—and was granted a monopoly. Thus the King was relieved of the cost of the posts, and something like a regular service was given.

The Commonwealth began the Post Office proper, by exacting a rent from the person to whom the letter monopoly was given, and this was continued to the Restoration. Toward the end of the eighteenth century an agitation was begun for the use, for the mails, of the stage coaches which were then running and were much faster than the mail carts which carried the mails, and the

plan was carried out by Pitt. In 1830 the first mail to be carried by railway ran from Liverpool to Manchester, and seven years later a mail was carried from London to Liverpool and Manchester.

Rates of Postage. The great reductions in postage associated with the name of Rowland Hill are so important that the rates of postage in 1839 are of interest. They had remained unchanged from 1812. The charges were based on distance, and for a single letter the charge was 4d. for a distance not exceeding 15 miles. There was a graduated scale beyond that distance, up to a charge of 1s. for 230-300 miles. Additional charges were levied to Scotland and Ireland in certain cases, and for crossing the Menai and Conway bridges, and packets of 1 oz weight were charged as four single letters. In 1839 a fourpenny rate was introduced, but immediately afterwards the penny post was established. The system of franking letters was

abolished, and at the beginning of 1840 the penny rate for $\frac{1}{2}$ oz. was begun. From that time to 1897 various reductions were made, and on the occasion of the Jubilee in that year the arrangement for $\frac{1}{2}$ oz. for a penny was made. This incorporated the sample post which had been established in 1863. The "packet post" had seen several reductions and was also affected by the concessions in 1897. Consequent

upon the World War, there were several changes in postal rates: for example, the minimum charge for postage on a letter was increased to 1 $\frac{1}{2}$ d. and on a post-card 1d.

Parcels Post.

The parcel post in England was inaugurated in August, 1883. This arrangement involved a payment of eleven-twentieths of the postage to the railway companies. In 1885 a parcel post was established with Gibraltar, Egypt, Aden and India, and afterward was extended to other countries. There have since been introduced various other postal arrangements and devices, for details of which reference should be made to the *Post Office Guide* (abridged edition for London, 1d.).

Telegraphs and Telephones. Telegraphy and telephony (which see) have come to be important portions of the Post Office enterprise all over the world, save in the United States. Before 1868 the telegraphs in England were chiefly in the hands of the railway com-

panies and of various private companies. In 1868 the Post Office acquired the telegraph business of these companies, and forthwith a rapid extension was made in towns and villages not previously connected with the system. Before 1912 the telephone business of the country was largely in the hands of the National Telephone Company, with the exception of the long-distance service, which has been worked by



THE POST OFFICE RAILWAY

The line is six and a half miles long, running from Paddington Station via the Western Parcel Office, Western District Office, Western Central District Office, Mount Pleasant, King Edward Building (G.P.O.), and Liverpool Street to the Eastern District Office. This underground railway is the only one of its kind in the world, being entirely automatic. There are no drivers on the trains. Nearly 30,000 mail bags are carried daily. Above: Mails on the sorting office conveyor. Below: Loading a two-truck train.

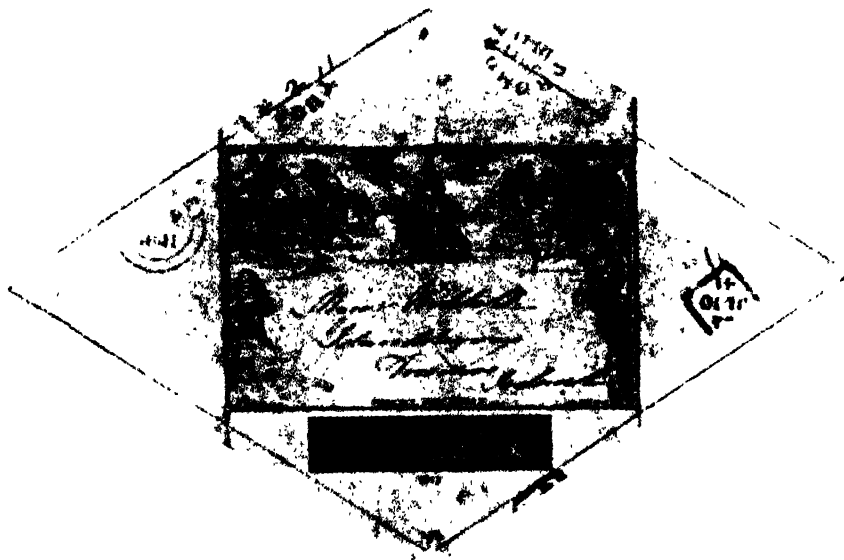
Photos: G.P.O.

the Post Office since 1896, a few municipal systems, and a considerable local Post Office system in London and in Newcastle and Cardiff. The Courts decided in 1880 that the telephone was a telegraph instrument, and thus came within the monopoly of the Postmaster-General, and telephone companies were only allowed to operate under licence. The wonderful improvement in telephone facilities, with the consequent rapid increase in the use of the instrument, is a matter of recent history.

Post Office Banking System. This may be dealt with under two headings: (a) the transmission of money, (b) the deposit of

The Post Office Savings Bank was mooted on several occasions before it was introduced in 1859. The object of the Bank was to encourage thrift and give facilities at all Post Offices for the deposit and withdrawal of money. Various devices have been adopted to popularize the Bank, such as the acceptance of small amounts by means of affixing stamps to slips, and the loan of home safes in which small amounts can be placed for deposit later at the Post Office.

Postal Union. It was only to be expected that the inauguration of the simplified postage introduced under the auspices of Rowland



THE MULREADY ENVELOPE

A stamped wrapper or envelope bearing a design by W. Mulready, R.A., issued on 6th May, 1840. (A few were sold on 1st May, but were unauthorized.) By 12th May it was found that there was no demand for them and they were recalled and destroyed. Simpler envelopes and letter sheets were issued in 1841.

Photo G.P.O.

savings and the purchase of Government stock, National Savings Certificates, etc. Money is transmitted by means of money orders and postal orders. The money order system was introduced at the beginning of the nineteenth century as a result of frequent thefts of money from letters. (See MONEY ORDERS.) Foreign money orders were issued, at Florence Nightingale's suggestion, in connection with the Crimean War for remittances homeward, but the system was gradually extended to admit remittances in both directions. Postal orders were first issued in 1881. They differ from money orders in that they are printed for fixed amounts.

Hill in 1840, should encourage the demand for better international arrangements. Until the time of Queen Victoria the considerable written intercourse which was needed for the rapidly expanding trade of the country was conducted solely by the merchants concerned. In 1863 the representatives of fifteen governments met in Paris, and in 1874 the Act constituting the Universal Postal Union was signed. The provisions of the new Convention have thus been described by the British Post Office. "A common regime was accepted throughout the whole postal service; freedom of transit by land and by sea was guaranteed by every country to every other country, rates of

postage were made uniform, that is to say, in future each country was to charge a uniform rate for each category of correspondence addressed to other contracting countries; no charge of any kind was to be collected in the country of origin from the sender of correspondence or in the country of destination from the addressee, other than that prescribed by the regulations; the onus of providing for the conveyance of mails was to rest on the country of origin, all inter-

the Post Office may be mentioned Business Reply Cards and Envelopes, under which business firms may issue with their circulars cards or envelopes for their client's reply without prepayment of postage, the postage (in addition to a small charge) being paid by the firm on only the replies which reach them; Air Mail services, for both letters and parcels; Business Reply Telegrams, enabling persons or firms who are registered with the Post Office for the purpose, to



NINETEENTH CENTURY MAIL COACH

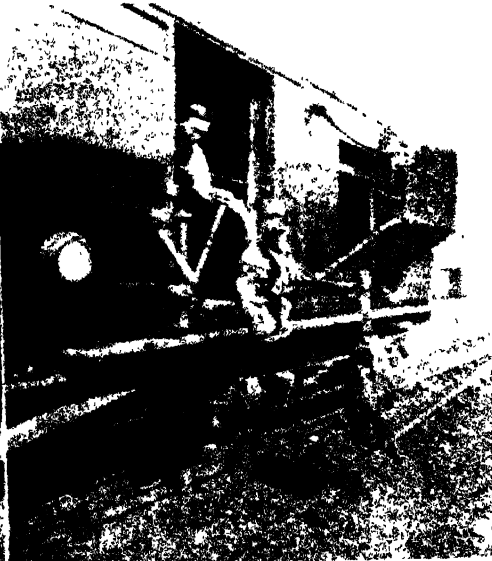
Photo G P O

mediate services used by such country to be paid for at fixed rates and upon the basis of periodic statistics." Congress followed Congress, and the range of postal enterprise was widened to include money orders, parcels, express delivery, the registration and insurance of valuable articles. The Congress in Washington in 1897 was notable for the claim of the British representatives that groups of countries could reduce the postal rates on communications passing between them. The Congress decided in favour of the proposal, and the result was the Imperial Postage Scheme, the Magazine Post between Canada and Newfoundland and the Mother Country, and the extension of the Imperial Scheme to include the United States and Egypt.

Modern Post Office Developments. Among the many recent services introduced by

distribute to their clients specially printed telegram forms, on each of which the address, the period of validity and the value are inserted by the participating firms. The many other postal services, in addition to those mentioned here, are fully explained in the *Post Office Guide*, which is published in January and July annually. There are supplements issued in April and October, as well as much other literature describing the various facilities, including those for late fee letters, express delivery, cash on delivery, registration, insurance, advice of delivery, private posting boxes, private bags, prepayment of postage in money, railway letters and parcels, the telegraph services, radio-telegrams to ships at sea, the telephone service, Savings Bank, National Savings Certificates, annuities, and pensions.

The political head of the Post Office is



POST OFFICE EVOLUTION

1. A Post Boy of 1774. 2. Sorting mails on a modern train. 3. In 1783 the mail left the offices of Russell and Co. in Killigrew Street, Falmouth, every Monday at noon, and proceeded to the Castle and Falcon Inn, Aldersgate, London. The 290 mile journey took five days. 4. Postman of 1882 riding a centre cycle. 5. Mail coach with net and arms down. These are for picking up mails while the train is in motion.

Photos: G.P.O.



MAIN OVERHEAD CONVEYOR

This carries the sorted letters to the van loading platforms or to the Post Office underground station.

Photo G.P.O.

the Postmaster-General, who has a place in the Ministry of the government.

POST-TERTIARY. See QUATERNARY PERIOD.

POTASH. The commercial name for certain compounds of the element potassium (which see). Strictly speaking, the name belongs to the carbonate (potassium, carbon and oxygen), which is chiefly used in the manufacture of glass. It was originally obtained by leaching the ashes of burned wood and boiling down the lye in large open kettles. The residue, a white solid, was called potash because it was made from *ashes* in *pots*. Potassium carbonate is prepared from the mineral sylvite, which is a nearly pure compound of potassium and chlorine. It is one of a group of minerals found in large quantities in the salt beds of Stassfurt, Germany.

In agriculture, fertilizers containing potassium are extensively used. Potassium in such fertilizers is usually stated in terms of the oxide (potassium and oxygen). The salt beds at Stassfurt have been for long the chief source of supply. Potassium is also found in the U.S.A., Eastern Russia and Italy.

Chemical Formulas. Potassium carbonate is K_2CO_3 ; that is, a molecule contains two atoms of potassium (*Kalium* in Latin), one atom of carbon, and three atoms of oxygen. The oxide is K_2O —two atoms of potassium and one atom of oxygen.

POTASSIUM, *potas'ium*. A soft, silvery-white metal. Potassium is one of the chemical elements, with the symbol *K* (from the Latin form, *kalium*). It is never found free in nature, but it exists in combination with other substances in soils, in plants, and in many rocks, about 2½ per cent of the earth's crust being potassium. The best-known source of potassium salts is at Stassfurt, near Magdeburg, Germany. The salts are subjected to a powerful electric current, which frees the metal from its compounds.

Potassium is an essential element of plant food, and a soil deficient in potassium will not produce good crops. Some potassium compounds are extensively used in the arts. The carbonate is *potash*, and the nitrate is *saltpetre*. The hydroxide, or *caustic potash*, on exposure to the air, or when dissolved in water, changes to the carbonate.

POTASSIUM BICHROMATE. See CHROMIUM.

POTASSIUM NITRATE. See SALTPETRE.

POTASSIUM PERMANGANATE, *per man' ga nayt*. See DISINFECTANTS.

POTATO. The most popular and widely used vegetable in the world. It belongs to the same family as the belladonna, the tobacco plant, and the tomato. Until the early explorers had carried some of the flora of the New World back to the Old, potatoes were unknown in Europe. They were not even seen in North America until after the middle of the sixteenth century, when they were first brought to Virginia from Peru.

The potato plant grows from 1 to 3 ft. high, and bears white or purple flowers and a round, purplish fruit about as large as a gooseberry. The latter is the seedball of the plant. The edible part is not the root, but a tuber, or underground stem, and the "eyes" are stem buds. New plants may be grown from seeds or from old potatoes or pieces of potatoes containing "eyes," but there is a striking difference in the results obtained.

Potatoes do best in well-drained, sandy-loam and respond readily to enrichment of the soil.



POTATO DRY ROT

Caused by autumn blight fungus

Potatoes are subject to several forms of potato rot, or blight, which attack leaves, stems and tubers. One of the most effective measures for checking these diseases is spraying the young plants with Bordeaux mixture. Rotation of crops, care in selection of varieties, avoidance of infested soil, and soaking seed tubers in a solution of corrosive sublimate are recommended as preventive measures. See **POTATO BUG**.

The world's annual potato crop runs into millions of tons. Russia and Germany produce the largest crops in Europe, with annual yields not far from 50,000,000 tons. Great Britain, Poland, Czechoslovakia, France and the U.S.A. all have large potato crops.

Potatoes are an excellent food for supplying energy, because of their high percentage of carbohydrates. They contain Vitamins B and C.

Though chiefly a table food, potatoes are also employed in the manufacture of starch,

There are two or three broods a season. The County Agricultural Authority or the Department of Agriculture should be notified upon its discovery in Great Britain.

Classification. The potato bug belongs to the family *Chrysomelidae*.

POTEEN' OR POTHEEN'. A word used in Ireland, literally meaning "little pot"; denotes whisky distilled illegally at home.

POTENTIAL. See **ELECTRICITY**.

POTENTILLA, also known as CINQUEFOIL (five-leaved). A hardy perennial plant to be found chiefly in the northern temperate regions, and bearing red, white, purple, or yellow flowers, and pinnate, digitate, or ternate leaves. Hybrid varieties produce showy plants, bearing a profusion of brightly-coloured flowers for cutting. *Potentillas* prefer light loamy soil in a sunny position, and will not succeed in damp heavy soil. They can be propagated from seed or by division of rootstock. Nearly all varieties bloom from late June to September. Silverweed, a well-known British species, has creeping stems with yellow flowers.

Scientific Names. *Potentillas* are of the natural order *Rosaceae*. Silverweed is *P. anserina*.

POT-HOLING. One side of the pastime of **SPELEOLOGY**. In the limestone and grit-stone districts of England there are to be found a number of curious formations



COLORADO BEETLE
Visual Service Education

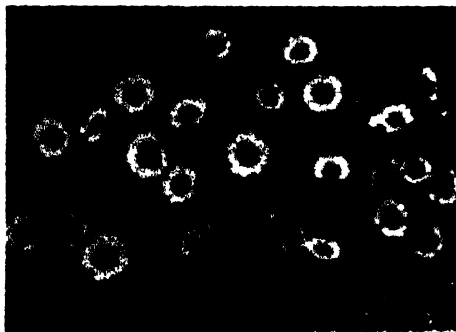


HARVESTING POTATOES BY MACHINERY
Photo U. & U.

and are used as food for stock. Flour suitable for making bread can be obtained from the tubers, and alcohol is also manufactured from them.

Scientific Name. The potato belongs to the family *Solanaceae*. Its botanical name is *Solanum tuberosum*.

POTATO BUG, OR COLORADO BEETLE. Name given to a stout yellow beetle, the most destructive of the insect pests which attack the potato plant in the U.S.A. and sometimes also in Europe. This beetle is about $\frac{1}{2}$ in. long. It may be recognized by its wing covers, on each of which there are five black stripes. It is a native of Mexico.



POTENTILLA
Photo Sutton & Sons

underground. These consist of what are locally known as "Pots," and are really great caves. They are formed in the gritstone uplands by faults in the geological system and in the limestone areas, where they more commonly occur, by the soft limestone rock being worn out during a period of hundreds of thousands of years by water. Famous examples of such caves are those of Cheddar and in Yorkshire, Gaping Ghyll and Alum Pot. There are indications of habitation of some of the pots by early Britons in the Stone Age.

POTIPHAR. See JOSEPH.

POTSDAM. See GERMANY.

POTTERIES. That part of North Staffordshire which is the chief centre of the pottery industry in Britain, including Stoke, Burslem, etc. In this area there are over three hundred pottery works. Clay is obtained from local extensive coalfields, but most of the requirements for the finer china-ware have to be imported into the area. At first pottery was subsidiary to agriculture, and it was not until Josiah Wedgwood (1730-95) founded his factory that pottery became an important national industry. From then onwards the district became noted for its china-ware, chiefly made from special clays brought from Dorset, Devon, and Cornwall.

POTTERY. The art of making vessels of clay. The name *ceramic*, or *keramic*, a term derived from the Greek *keramos*, "pottery," is applied to this art.

Clay containing the proper amount of moisture can easily be worked into a plastic state that will admit of its being fashioned into any shape desired. When dried, the clay becomes hard and firm. The simplest form of pottery can be made with but few tools, and primitive peoples attained considerable skill in making earthenware.

The first step in the making of pottery consists in the preparation of the material. Clay of various grades is used. That containing any appreciable amount of iron turns red when burned, whence the red colour of bricks and of the coarser varieties of earthenware, such as flowerpots and crocks. Some varieties turn reddish-brown, and others cream colour. But whatever the quality of the clay when it reaches the factory, it must be finely ground in water. Before grinding, any hard objects, such as small stones or pebbles, are separated from it. During the grinding, fine sand, feldspar, or flint may be added. The proportions of these ingredients are determined by the ware to be made.

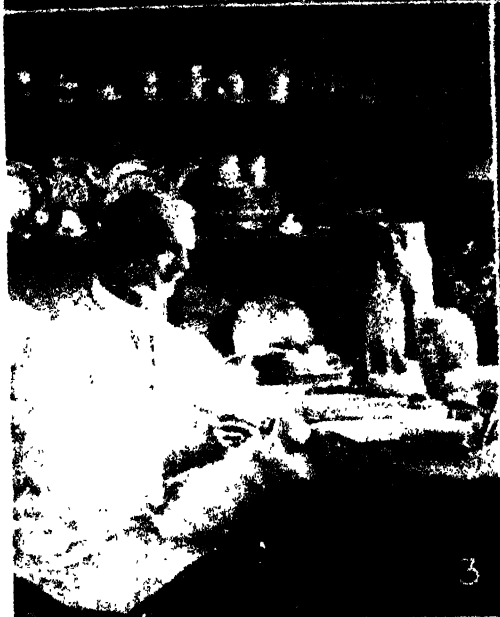
Vessels are fashioned by hand, in moulds, and by the use of both the hand and the mould. Only a few tools are employed. The potter takes the quantity of clay necessary for the vessel he is to make, and throws it on the centre of a horizontal disk called the *potter's wheel*. The wheel may be turned by a crank and pedal or by power. In either case, the speed of the wheel is easily regulated.



TEA SERVICE OF CHINA

The design is in red, black, and gold. The china figure is in pink and cream.

Photo Dallmeier



PROCESSES IN POTTERY MAKING

1. Removing Bourn Vita ware jugs from moulds at the Wedgwood factory. 2. Jollying a plate (for Bourn Vita ware) on a mould. 3. An artist painting a large vase in the Doulton works. 4. Dipping a cup in glaze. 5. Printers taking transfers from copper plates. 6. Throwing a vase on the potter's wheel.

Photos: Doulton, Cadbury

to suit the convenience of the workman. With moist hands the workman forms the clay into shape as the wheel revolves. If a hollow vessel is desired, he forms the clay into a cone, then presses down upon the apex with his thumbs, and gradually works into the mass until by skill of hand he shapes the vessel. The finishing touches are made with tools of wood and leather; then the vessel is placed in the drying room to harden.

Revolving moulds called *jiggers* are now used in all large manufactories, and they greatly increase the output.

Vases and many other hollow vessels of fine ware are now shaped in moulds of plaster of Paris, which are made in sections so that they can be taken apart easily. This method is known as *casting*. The mould is filled with a thin mixture of water and clay and allowed to stand until a layer of clay is deposited on the sides, when the mixture is poured out. The porous plaster of Paris absorbs the water, leaving the shell of clay. When this has sufficiently hardened, the mould is taken apart.

Firing. Clay that is hardened by drying will again absorb moisture. To prevent this, it must be heated to a high temperature. After the pottery has hardened in the drying room, it is placed in cylindrical earthen cases called *saggers*, which are stacked one above the other in a kiln. The firing lasts from thirty-six to forty-two hours, and the ware is usually heated to a white heat. The style of kiln, degree of heat, and time required for firing vary for different kinds of ware. When taken from the kiln, where they have been allowed to cool slowly, the articles are known as *biscuit*.

Glazing. This process consists in coating the ware with a substance which, when fired, will give a hard, glossy finish. Various substances are used, including lead oxide, or litharge, powdered feldspar, flint, white clay, Paris white, and other substances. The glaze is ground to a very fine powder and mixed with water.

This mixture, which is known as *slip*, is a little thicker than milk. The articles are dipped in the slip and so handled by the workman that the glaze is evenly distributed over them. The water is absorbed by the ware or evaporates, leaving a thin coating of glaze which must be fused by heat; thus a second firing is necessary. The temperature in the glazing kiln is raised very slowly, and the ware is allowed to cool slowly. The firing changes the glaze to a transparent gloss which brings out clearly any figures that may have been placed on the ware.

Colour effects are produced by colouring the glaze. One part of the article may be

dipped in one glaze and the other part in another. Sometimes the glaze is poured on the ware in an oven, and since its flow is stopped by heat, beautiful shaded effects are produced. Glazing is the finishing process, and when the ware comes from the glazing kiln, it is ready for the market, unless decorations are to be added. These are put on by hand, either before or after glazing. In the latter case a third firing is necessary.

Varieties of Pottery. There are many varieties of pottery, but all fall into three classes—

Earthenware. This includes all the coarser grades of pottery. It is usually thick and heavy and poorly glazed, or without glazing. Jugs, crocks, and the heavier grades of ware used for cooking and table purposes are good examples. The pottery of prehistoric times and that now made by barbarous and partially civilized peoples belong to this class.

Stoneware. This is a higher grade than earthenware, and includes most of the tableware in general use. It is made of good material, is hard and light, well enamelled, and often beautifully decorated.

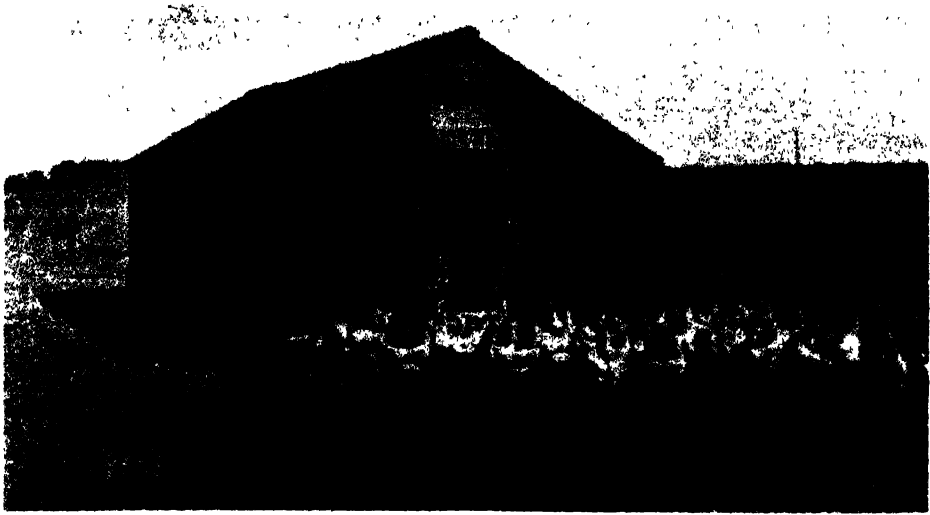
Porcelain, or China. This is the finest grade of pottery and likewise the most expensive. Chinaware can easily be distinguished from stoneware if specimens are held up to the light. The china is translucent; that is, some light will pass through it. No light will pass through stoneware.

History. Pottery-making is one of the oldest of arts, dating from prehistoric time, and discoveries of ancient pottery have enabled antiquarians of the present to judge the stage of civilization reached by the people who made the articles. The ancient Egyptians attained a high degree of skill in making pottery, as did the Assyrians and Babylonians. The ancient Greeks invented the potter's wheel, and they produced the most remarkable pottery of antiquity. The Romans obtained their knowledge of the art from the Greeks and the Etruscans. With the extension of the Roman Empire, the art was carried to all parts of the civilized world.

The Chinese for many centuries have excelled in the manufacture of delicate ware, and the Japanese are nearly their equals in this respect. France, Germany, Holland, and England have each taken a prominent part in the development of modern pottery, and manufacture it on a large scale. For German and French (Sèvres) pottery, see DRESDEN CHINA; PORCELAIN. See also CLAY; FAIENCE; KAOLIN.

POUCHED RAT. See GOPHER.

POULTRY. In a broad sense, the term "poultry" is applied not only to the common barnyard fowls—the cock and the hen—but



A FLOCK OF TRAPNESTED BUFF ROCKS

By courtesy of Gettern Model Poultry Farm

to ducks, geese, turkeys, guinea fowls, and a few other domesticated birds. The science of rearing the common fowl, however, has attained such importance that poultry-raising is now practically synonymous with chicken-raising.

In America, poultry farming has become specialized, with excellent results—each farmer concentrating on one particular branch, such as supplying day-old chicks, or producing table birds, or eggs, etc.

In England this custom is slowly being adopted. But the production of new laid eggs is not considered sufficiently remunerative to run as a branch by itself, owing to the comparatively high cost of food-stuffs and expensive labour. The greatest difficulty with which the chick rearer has to contend is the mortality among the young stock. The losses are generally estimated during the first two or three weeks of life at quite 40 per cent. This condition is largely influenced by the dread disease known as *coccidiosis* or bacillary white diarrhoea, conveyed to the chick by a germ from the parent.

Breeding stock can now be blood tested to eliminate these germ-carriers, thus facilitating the rearing to a large extent. The sex of the chick can also be determined as soon as it leaves the shell, which greatly reduces the cost of rearing for pullets. Usually a hatch consists of 50 per cent of either sex. The little cockerels can then be fattened up to the age of six weeks and sold for table purposes as *poulet poussin*, for which there is considerable demand. The favourite

breeds for table birds are to be found among the heavy types, such as White Sussex and Indian Game, these two making an excellent cross for this purpose. From the incubators they are placed in specially designed fattening coops which permit of very little exercise, fed entirely on flesh-forming foods, and at the age of three months are considered ready for market. White Leghorns were for a considerable time much favoured for egg production. But lately they have been somewhat overshadowed by the White Wyandotte and Rhode Island Reds, heavier types of bird combining egg-laying powers with table utility.

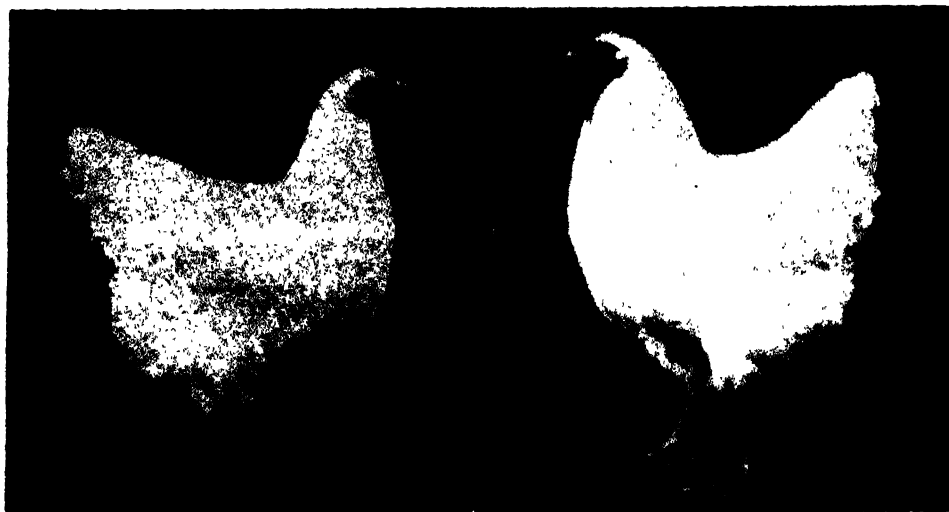
A standard method of classification divides chickens into *classes*, *breeds*, and *varieties*, with reference to their place of origin, size



EXTERIOR OF MODERN FOWL HOUSE

and shape, and colour, respectively. The following table includes the most important fowls of economic value—

CLASS	BREED	VARIETY
English	Dorking	White, Silver, Grey, Coloured.
	Orpington	Single-Comb Buff, Single-Comb Black, Single-Comb White.
	Sussex	Heavy, Light.
American	Plymouth Rock	Barred, White, Buff, Silver Pencilled, Partridge.
	Wyandotte	Silver, Golden, White, Buff, Black, Partridge, Silver Pencilled.
	Rhode Island Red	Single Comb and Rose Comb.
Asiatic	Brahma	Light and Dark.
	Cochin	Buff, Partridge, White, Black.
Mediterranean	Leghorn	Single-Comb Brown, Rose-Comb Brown, Single-Comb White, Rose-Comb White, Single-Comb Buff, Single-Comb Black, Silver.
	Minorca	Single-Comb Black, Rose-Comb Black, Single-Comb White.



WHITE WYANDOTTE COCKEREL (left) AND HEN
By courtesy of "The Poultry World"

From the standpoint of utility, chickens are classified as *egg breeds*, *meat breeds*, and *general-purpose breeds*. (Fancy breeds, including the bantam fowls, are reared only for peculiarities of appearance, and need not be considered here.)

It should be remembered, however, that hard-and-fast distinctions cannot be set up in this method of classification, for there is wide variation in the qualities of individuals within the same breed. At the same time, the following general statements as to characteristics may be made—

Chickens belonging to the egg-breed group are small and active, mature early, have good foraging habits, are disinclined to brood, and are sensitive to cold. Examples are Leghorns and Minorcas.

The meat breeds include chickens of large size, slow movements, poor foraging habits, and poor laying qualities; they are gentle in disposition, persistent brooders, and mature late. Examples are Brahmas, Cochins, and Dorkings.

General-purpose fowls are of medium size, produce a fair number of eggs, are good table birds, and good brooders and mothers. They

are more active than meat fowls and less active than the egg-layers. Examples are Plymouth Rocks, Sussex, Orpingtons, Wyandottes, and Rhode Island Reds.

Care of Poultry. Chickens cannot thrive on wet land, so the plot selected for their run should have good natural drainage. Accumulations of mud can be prevented by spreading sand or gravel on the ground. Chickens should have plenty of room in which to run about, for they require exercise. If the business is conducted on a general farm where it is not advisable to give them free range, they should be provided with fenced-in yards of reasonable size. Housing is a matter of first importance. Elaborate design and costly fittings are not essential, but convenience and provision for cleanliness and ventilation are prime requisites. The henhouse should be warm in winter and cool in summer, provided with good roosting facilities, and so constructed as to prevent the entrance of rats, vermin, and other chicken pests. Overcrowding of poultry

especially of the little chickens, should always be avoided.

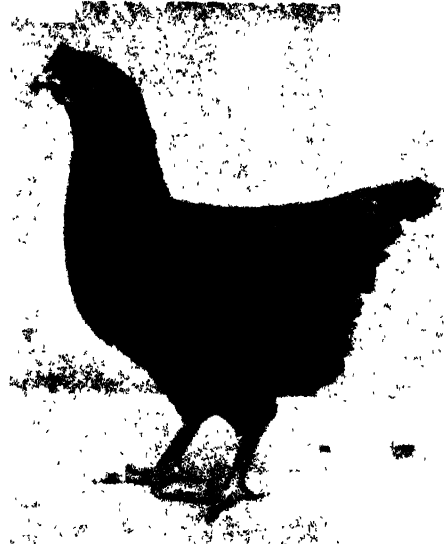
Chickens should not be fed in a haphazard manner, for it has been definitely proved that the eggs as well as the meat are affected by the food. Egg-layers should be fed a mixed diet of grain, animal food, and green matter, and should also be supplied with lime and other mineral matters that enter into the composition of eggshells. Grit, for helping to digest the food, and an abundance of pure water are no less important. Though maize is the standard grain for fattening fowls, wheat and oats are essential for egg-



LIGHT SUSSEX HEN (above) AND COCK
By courtesy of "The Poultry World"



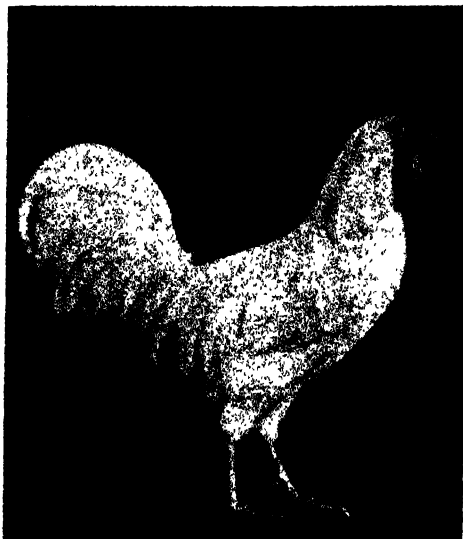
RHODE ISLAND RED COCKEREL
By courtesy of "The Poultry World"



RHODE ISLAND RED HEN
By courtesy of "The Poultry World"

layers. In general, egg-layers should have a diet in which the ratio of protein to carbohydrates and fat is one to four or five.

Breeding and Hatching. Poultry-raisers are now giving much attention to the subject of breeding, as they know that the success of the business depends upon the elimination of the weakling and the propagation of



WHITE LEGHORN COCKEREL
By courtesy of "The Poultry World"



WHITE LEGHORN HEN
By courtesy of "The Poultry World"

strong, vigorous, serviceable fowls. Within recent years, the science of artificial hatching has been brought to a high degree of excellence. See INCUBATOR

Food Values. Chicken meat is universally esteemed for its delightful flavour. Another point in its favour is its attractive appearance, for chicken "looks good to eat," whether broiled, fried, roasted, or stewed. As it is easily digested, it is an excellent

food. The meat of young chickens, called *broilers*, has less fat in its composition than that of older fowls, but it is considered more delicate in flavour. The average composition of broilers and fowls is as follows:

CLASS	REFUSE	WATER	PROTEIN	FAT	ASH
Broilers	41.6	43.7	12.6	1.4	2
Fowls	25.9	47.1	14.0	12.3	7

Broilers have a fuel value of 280 calories per pound; fowls, of 751 calories.

POUND. A unit of weight for measuring many commodities. There are three denominations--*apothecaries'*, *avoirdupois*, and *troy*. The pound avoirdupois contains 7000 grains or 0.4536 kilogram, and is divided into sixteen ounces. The troy and apothecaries pounds contain 5760 grains each, or 0.3732 kilogram, and are divided into twelve ounces. The troy pound, however, is little used in practice, except for weighing precious metals. The *grain* is the basis of computation in all three denominations, and does not itself vary.

The *pound sterling*, the highest denomination used in British money accounts, is equal to twenty shillings. It received its name from originally being equal to a quantity of silver weighing one pound. See MONEY.

POUND. The name of a place or enclosure maintained by a town or city wherein may be kept stray animals until they are called for or otherwise disposed of. The word undoubtedly is derived from the verb *impound*.



INTERIOR OF MODERN FOWL HOUSE

meaning "to shut up." The keeper of a pound is called *poundkeeper*.

POUSSIN, *pu'sa*N, NICOLAS (1594?-1665). A French painter. His desire to become



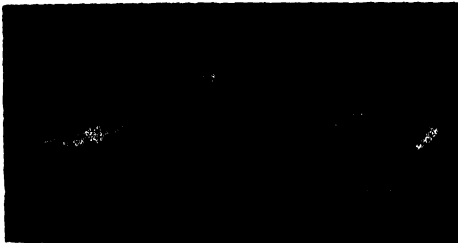
POUSSIN
Photo. Brown Bros.

an artist led him first to Paris, where he studied in the studio of L'Allemand, and then to Rome. Perhaps the most valuable part of his art education came through his admission to the studio of Domenichino, the most famous painter in Rome and a figure of considerable eminence. Whilst in Rome he married

the daughter of a fellow-countryman after she had nursed him through a severe illness.

Little by little his fame increased, and he became first painter to the King through the patronage of Richelieu. Many of his greatest paintings are in the Louvre; more than twenty are in Madrid, and others are in many great galleries of Europe. The National Gallery, London, has his "Cephalus and Aurora."

POUT. This relative of the cod is not often seen. It is a southern species, commonest in the English Channel and southward toward the Mediterranean. It is sometimes



POUT FISH
Photo. Weller

known as the bib, and is easily recognized by the deep and symmetrical body and the dark barred sides—possessed by no other member of the cod family.

Scientific Name. *Gadus luscus*.

POWAN. Found only in Lochs Lomond and Esk, the powan is the Scottish member of the family to which the pollan belongs. It is similar in habit, and roughly similar in appearance to the Irish species.

Scientific Name. *Coregonus clupeoides*.

POWER. In arithmetic and algebra, the result obtained when a quantity is multiplied

by itself a specified number of times. The second power, or square of a number, is found by multiplying the number by itself once; the product obtained by taking a number three times as a factor is the third power; four times, the fourth, etc. The degree of the power, or the number of times the given quantity is taken as a factor, is expressed by a number called the *exponent*, which is written to the right and above the quantity, as 6^3 , 3 being the exponent.

POWER OF ATTORNEY. A deed authorizing a person to act as one's agent for certain specified purposes. A deed is not usually necessary for effecting a contract of agency; but if the agent is to execute a deed on behalf of his principal then he must be appointed by deed. Another reason why agencies are often constituted by power of attorney is that an ordinary contract of agency is automatically revoked and the authority of the agent terminated by the death, bankruptcy or lunacy of the principal, whether known to the agent or not. A power of attorney, however, can be made irrevocable for a year, or indefinitely if the agent pays for this privilege. See AGENT, DEED.

POYNINGS' ACT, 1495. A statute of the Irish parliament procured by Henry VII's Deputy, Sir Edward Poyning; it was directed to recovering for Henry the power that had been usurped by the Anglo-Irish baronage. The Act provided that all statutes "lately" (construed as "previously") made by the English parliament were to have the force of law in Ireland; and that no Irish parliament should assemble until a list of all proposed legislation had been submitted to the King, with the authority of his lieutenant in Ireland, and had been finally approved by the King and his Council. The initiative thus secured to the King gave him a firm hold on political development in Ireland, and it was not until 1782 that an Irish parliament, led by Henry Grattan, successfully demanded the repeal of the Act and of all later Acts limiting its own powers.

POYNTER, SIR EDWARD JOHN (1836-1919). An English painter of historical and classical subjects. Poynter was born in Paris in 1836. He studied in Paris and in England; in 1876 he was elected an Academician, and succeeded Millais as President in 1896. He held more than one important teaching post and in 1894 was appointed director of the National Gallery, a post which he held until 1905. He was knighted in 1896 and made a baronet six years later. His own paintings were scholarly and academic. The "Visit to Aesculapius" in the Tate Gallery, London, is typical of his work.

PRAEMUNIRE, *prə mū nē're*. A medieval writ beginning *P. facias*: "cause to be forewarned." Originally directed only to offences tending to prejudice the supremacy of the Crown by the recognition of a foreign Power, the writ to-day covers several offences whose only connection is their common penalty: the withdrawal of the King's protection, imprisonment for life and forfeiture of all property. The earliest Statute of P. was enacted in 1353, and forbade the taking abroad of causes triable in England, but the best known is that of 1392, which was aimed at those procuring excommunications or Papal bulls from Rome. It was under this latter Statute that Cardinal Wolsey was indicted for having exercised the Legatine authority.

PRAETOR, *prē'tor*. One of the most important magistrates in the republic of ancient Rome. Originally, the name was a title of honour borne by the consuls, but when, in 367 B.C., the plebeians were given rights to the consulship, the patricians demanded that they be allowed to appoint the new officers from their own number. To this new magistrate, who was called *praetor*, was given the judicial part of the duties of the consuls. When the praetorship assumed greater importance, the plebeians demanded that they be given the right of holding the office, and gained this privilege in 337 B.C. About 227 B.C., the praetors became four in number; at a later date there were as many as eighteen. A praetor held office for a year, and at the close of his term was usually sent as governor to a province. Roman law was greatly indebted to the edicts of the successive praetors.

PRAETORIAN, *prē'tor'ian*, **GUARD**. The personal guard of the Roman Emperors, consisting of picked men from the legions. Augustus made of the praetorians a standing army consisting of nine cohorts of 1000 men each, three cohorts being kept in Rome, the others in nearby cities. Under Tiberius, the cohorts were given a permanent camp in the city, and under Vitellius their number was increased to sixteen. Members received double the pay of the regular soldiers, were held to be equal in rank to the centurions of the legions, and at the close of their sixteen-year terms were given a liberal reward. The praetorians acquired dangerous power, having great influence on the succession of Emperors. It became absolutely necessary for a would-be Emperor to win their favour by bribery, or to buy it after his election. The Praetorian Guard was abolished in A.D. 312 by Constantine.

PRAGMATIC SANCTION (from the Latin *sanctio pragmatica*). In medieval and later European history, the term applied to a

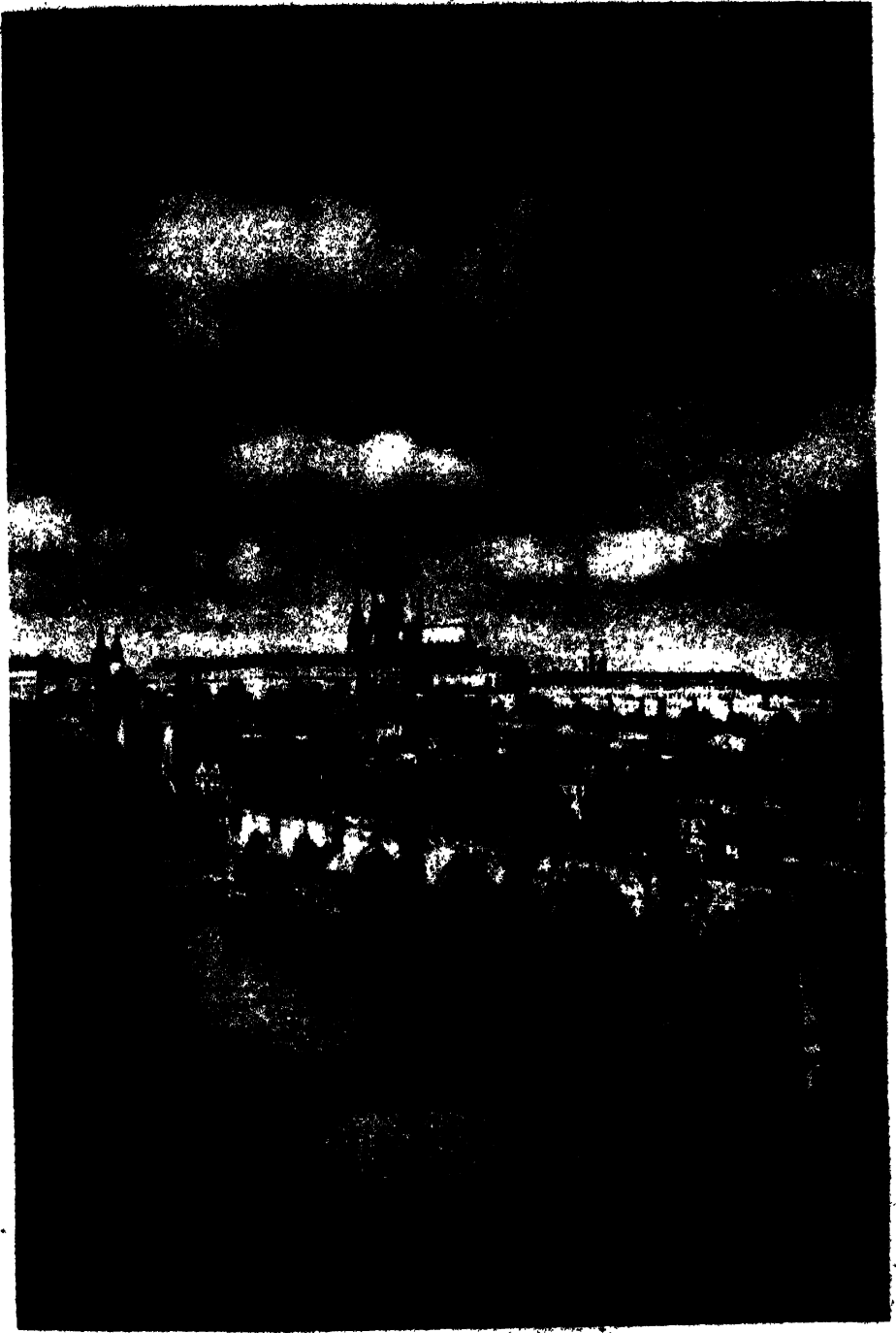
decree which made a change in the constitution of a state. Of several pragmatic sanctions, the one of greatest importance was that issued by the Emperor Charles VI in 1731, and usually referred to by historians as the Pragmatic Sanction. Charles, who was Holy Roman Emperor, had no male heirs, and so issued a decree settling his possessions on his daughter, Maria Theresa, later Empress. Her efforts to maintain her rights after Charles's death resulted in the War of the Austrian Succession. See **SUCCESSION WARS**.

PRAGMATISM, *prag'mā tiz'm*. A theory in philosophy that the meaning of concepts is to be sought in their practical consequences. The term was first used in print in 1898 by William James in his treatise entitled *Philosophical Conceptions and Practical Results*. James is said to have derived the idea from an essay by Charles Peirce on *How to Make Our Ideas Clear*, published in 1878. The test of an idea, according to Peirce, was to examine the consequences which it produces in action. This simple and practical rule was used by James to test all the prevailing theories in philosophy, and it led to new definitions and a new outlook. It changed the view of truth as an objective relation, and made it correlative with human judgment and human needs. That is, there is no such thing as abstract truth independent of all human associations. "Truth is one species of good, and not, as is usually supposed, a category distinct from good, and co-ordinate with it. The true is the name of whatever proves itself to be good in the way of belief."

PRAHA, *prah' ha*, OR **PRAGUE**, *prayg*. The former capital of Bohemia, now the capital of the Republic of Czechoslovakia. It is situated 150 miles north-west of Vienna, at the base and on the slopes of hills which skirt both sides of the picturesque River Vltava. Its commercial importance is enhanced by its situation on this navigable waterway and its position at the junction of seven railways.

The city is divided into several districts, the most interesting of which is the Altstadt (Old Town), on the right bank of the river. Among the points of special interest are the town hall, the new Czech National Theatre, the old Jewish graveyard, and the Czernin Palace, now used as a barracks.

The industrial establishments are numerous and varied, and include factories for the manufacture of railway carriages, leather, cotton goods, gloves, chemicals, flour, and beer, and printing and publishing houses. The city is an important sugar market, and centre of trade for local manufactures. New projects include the construction of a



PRAGUE
A view of the Altstadt (Old Town)
Photo: Czechoslovak Travel Bureau

railway round the city, and electrification of all lines within a radius of about 40 miles.

Prahā is supposed to have been founded by German settlers about 1100. Population, 920,000 (1935).

PRAIA, *pri' a*. See CAPE VERDE ISLANDS.

PRAIRIE. A general term applied most frequently to the broad, grass-covered lands lying in the region of the Mississippi and Ohio valleys, U.S.A., and in the provinces of the Dominion of Canada east of the Rockies, where the land is gently rolling and often almost treeless.

PRATINCOLE, *prat' in kōl*. A plover-like bird; the several species range from southern Europe to Australia and form a distinct family (*Glareolidae*) which is closely related to the plovers. Pratincoles are only rare stragglers to the British Isles. They have long wings and partly forked tails; they are small and delicately coloured, with (generally) a dark band like an inverted horse-shoe round the throat.

Scientific Name. *Glareola pratincola*.

PRAWN. With the shrimp, this crustacean forms a valuable food for human con-



PRAWNS
Photo Herridge

sumption and a great part of the diet of many sea fishes. The prawn grows to about 4 in. in length, and differs from the shrimp in its paler colour and the transparency of its carapace or shell-like covering.

Scientific Name. *Leander serratus*

PRAXITELES, *prak sit' el-ez*. A Greek sculptor of the fourth century B.C. With his less famous contemporary, Scopas, Praxiteles led the later Attic School, so called to distinguish it from the earlier Attic School of Phidias. Very little is known of the life of Praxiteles, except that he was a citizen of Athens and that he was at the height of his career about 350 B.C. Most of his prin-

cipal works have perished. He excelled in the portrayal of the human form, especially the female figure, and is said to have established the type for Eros and the Satyr, conceiving them in new forms of youth and beauty. He also gave a new conception of the beauty of Aphrodite in his statues of this goddess at Cnidus, Cos, and other places.

"Hermes Carrying Dionysus," found at Olympia in 1877, is the only one which is known to be an original. All of the others attributed to him are copies.

PRAYER. The word derives its primary meaning from the Latin *precari*, meaning "to ask earnestly, to implore." This use of it was common in secular language in former times. In its religious sense, however, prayer, while retaining its chief meaning of a petition for spiritual or temporal benefits, may embrace all activities of the mind and spirit which bring them into touch with God, such as acts of worship, thanksgiving, love and adoration. Any form of reverent communing with the Deity may be described as prayer.

The most ancient form of Christian public prayer is the Liturgy, those devotions which from early times have clustered round the central act of Christian worship, the commemoration of the Last Supper of Christ. There fall under this head also the Divine Office, services chanted by monks in Convent choirs, and those by clergy in Cathedrals and churches with their congregations, as, for instance, in the Anglican Church, the services of Morning and Evening Prayer. All Christian bodies practise some form of public prayer, either set or of a more elastic nature.

Jesus Christ raised the whole subject of prayer to its highest level, superseding by His teaching false ideas and unworthy methods. He left to His followers the Pattern Prayer. See LORD'S PRAYER.

PRAYER, BOOK OF COMMON. Usually called briefly *The Prayer Book*, this book contains the services authorized for use in the Church of England, together with the *Psalter* (which see). It has a long history in the making, and in its present form dates from the year 1662.

It derives from five service books in use in the Church prior to the Reformation in England, namely, the *Breviary*, which contained the offices used for the hours of prayer; the *Missal*, containing the office for the celebration of Holy Communion; the *Manual*, containing the occasional offices, such as Holy Baptism and Holy Matrimony; the *Psalter*; and the *Pontifical*, containing the offices reserved for the Bishop, such as Ordination.

These books were in Latin, and from their number difficult to put into the hands of the people. The aim of the compilers of the Prayer Book was to combine these several features into one book in English, which could be used regularly in Church, which would allow of intelligent understanding and response by the congregation, and which would provide a continuity of psalms and lessons and make for uniformity.

The germ of this plan is to be found in 1544 when a Litany in English was set forth by Cranmer. This was followed in 1548 by an "Order for Holy Communion" which contained English interpolations in the Latin rite. And in the following year the first Prayer Book of Edward VI was published, incorporating the above offices and adding services for Morning and Evening Prayer, the Psalter, and the other services derived from the Manual and the Pontifical, all in the English tongue. On this all future revisions were based.

This book was revised in 1552 in the second Prayer Book of Edward VI, a revision which was strongly influenced by the foreign Calvinistic Reformers of the time. It was in use only for a very short period, for during the reign of Mary the Latin services were restored. But in 1559, the second year of Queen Elizabeth, the English use was again adopted and a second revision was set forth very much nearer to the first Prayer Book than had been the book of 1552. Suppressed by Act of Parliament under the Commonwealth in 1645, Queen Elizabeth's book was resuscitated and revised, with additions, at the Restoration; this revision, the modern "Prayer Book," was issued in 1662.

On the grounds that the archaism of some of its language and its seventeenth-century outlook caused it to be out of touch with the advanced knowledge and the fresh needs of the modern world, proposals were made early in this century for a new revision. Twenty-one years between 1906 and 1927 were occupied in the consideration of the details, and in the latter year the Church Assembly passed "The Prayer Book Measure" and presented the new book to Parliament. It was passed by the House of Lords, but rejected by the Commons. A second revision was then made by the bishops and passed by the Assembly, but this was again rejected by the Commons in June, 1928. See CHURCH OF ENGLAND.

PRE-CAMBRIAN, *ham' brian*, **TIME**. See AZOIC AGE.

PRECEDENCE, *pres' ed enca*. The order of place to which Members of the Royal Family, peers, nobles, etc., are entitled, by right or by courtesy, on public occasions. Among persons of equal rank, precedence is

given to the older creation. Precedence in the different degrees of the peerage is in the following order: (i) Peers of England, (ii) of Scotland, (iii) of Great Britain, (iv) of Ireland, (v) of the United Kingdom and Ireland, according to the dates of their respective patents. Precedence of ladies is derived from the father or husband, excepting in the case of a peeress in her own right. Foreign ambassadors are given precedence immediately after the Royal Family. In county precedence the Lord-Lieutenant has first place, and the Sheriff second. In city and other councils, the Lord Mayor (or Mayor) takes precedence, followed by aldermen, sheriffs, chief officers, and livery.

PRECESSION, *pre sesh' ūn*. See NUTATION.

PRECESSION OF THE EQUINOXES, *e' kwīn ok ses*. A term used in astronomy to describe the motion of the equinoxes, the points at which the celestial equator and the ecliptic intersect. The attraction of the moon and sun on the equatorial ring of the earth causes the earth's equator, and therefore the celestial equator, gradually to change its position with reference to the ecliptic. The effect is to produce a movement of the points of intersection of these two circles. This motion is not uniform, and for convenience it is analysed into two parts. The uniform part is called the *luni-solar* precession, and is a westward movement of the vernal equinox amounting to 50.4" per year; the variable part is made up of several parts called nutations. At the same time, there is another similar, but much smaller, effect produced by the attraction of the planets, called *planetary* precession, which causes a change in the position of the ecliptic, and would cause the equinoxes to move eastward. The combined effects of these two movements is called the *general* precession, and is a westward motion of the equinoxes amounting to 50.3" per year. At that rate it will take about 25,800 years for the vernal equinox to complete the ecliptic.

Because of this movement, the celestial pole of the equator traces a small circle among the stars in the same period, 25,800 years, and thus different stars successively become polestars. The celestial pole is now approaching the present polestar, and within the next century, will pass it at a distance of about one-half degree. About 4000 years ago, the celestial pole was near the star Alpha Draconis, which was then the polestar, and a few thousand years hence Alpha Cephei will play that rôle. See ECLIPTIC.

PRECIOUS STONES. See GEMS.

PREDICATIVE WORDS (or COMPLEMENT). Certain intransitive verbs such as *be, become, seem*, which do not express action, are followed by predicative nouns, pronouns, or adjectives, so called because they complete the predicate of which the verb forms part. Examples: He is the *manager*; It is *I*; You seem *ill*. *Manager* and *I* name the same person as the subject of the sentence: the adjective *ill* qualifies the subject. A passive verb can also be followed by a predicative word: He was appointed *manager*. Some transitive verbs may take a predicative word referring to the object: They appointed him *manager*.

PREFERENCE SHARES. See INVESTMENT.

PREHISTORIC AGE. See CIVILIZATION.

PREHISTORIC ANIMALS. See DINOSAURS; MAMMOTH; PTERODACTYL, etc.; also FOSSIL.

PREHISTORIC BRITAIN. No written records exist of the British Isles prior to the Roman invasion. The course of events can only be inferred from remains unearthed in progress of archaeological research and from the standing-stone and other monuments, whose significance has only been recognized during the last fifty years.

The earliest inhabitants of these islands are thought to have been men of the Lower Palaeolithic Period. A skull believed to have belonged to this period was discovered at Piltdown in Sussex. Its date cannot be

from time to time, by people of various cultures of the Old Stone Age. All these peoples lived a nomadic life and were concerned only with hunting and obtaining sufficient food for the needs of themselves and their families. It is due to the fact that they were inevitably drawn to the rivers to



MEN-AN-TOL NEAR PENZANCE

Probably the remains of a chambered barrow.

Photo L. V. Grinnell

find water that we are able to reconstruct something of their manner of life: for they dropped their implements in the gravels on the banks of rivers, so that when the rivers swelled at time of flood, these implements were buried, only to come to light again in the course of modern research. Such weapons have been found particularly in the Valleys of the Thames and Wey, the Farnham terraces having yielded some of the richest finds in Europe.

The progress which was gradually made in the manufacture of these weapons from flints is magnificently illustrated in the collection at the British Museum. The principal signs of advance in design are growing economy in the use of flakes chipped from the main flint nodule, and in an increasing symmetry. It is possible, also, from the discovery of fossils and fragments of tusks, teeth, etc., to visualize the kind of animal-life existent at that time, including the mammoth and the sabre-toothed tiger. The remarkable fact is that prehistoric man was able to defend himself against such adversaries with his crude weapons.

At a later date, Palaeolithic man utilized rock shelters and caves to give added protection. Wookey Hole in Somerset, Oldbury Hill in Kent, the Cresswell Crags and Robin Hood's Cave on the borders of Derbyshire and Nottinghamshire, and Kent's Cavern at Torquay, are some of the principal places which have yielded traces of this period—a period which saw the beginnings of primitive art, as evidenced by the incised figures on bone which have been discovered at the Cresswell Crags. Objects found



LANYON QUOIT

A burial chamber near Penzance.

Photo: L. V. Grinnell

fixed with any degree of certainty, but is unlikely to be after 25,000 B.C., and may probably be attributed to the warm "interglacial" period between the first and second Ice Ages. From that date until the beginning of the fifth millennium B.C. Britain seems to have been inhabited either continuously, or

in the caves of the Somme Valley in France, and at Altamira in Spain, thought to date from a similar period, lend support to the theory that the beginnings of Art were linked either with religion or superstitious beliefs. It appears, also, that man had domesticated the reindeer, which must be

whilst the arrow-heads and beautifully shaped spear-heads were made from the flakes struck off the nodule. Great numbers of scrapers, borers, axes, spear-heads and arrow-heads have been discovered on most of the high ground of Britain, particularly in the chalk country. Unlike the Palaeo-



NEOLITHIC LONG BARROW AT EAST KENNET, WILTSHIRE

Photo: L. V. Grinnell

regarded as the first of Britain's domestic animals.

Soon after 5000 B.C. a new culture appears in Britain, that of the New Stone Age, of which the traces are much more numerous. Implements continued to be manufactured from flint, but, in place of the simple flaking adopted by previous civilizations, the finished implement was often ground or

lithic implements, which have to be dug out of the gravel, they lie on the surface of the ground or just under it. In two places in England—Cissbury Ring in Sussex and Grimes' Graves in Norfolk—there is evidence of the mines from which the flints were obtained and probably exported to other parts of the country.

Neolithic men entered Britain by the



ROUND BARROW NEAR COLLINGBOURNE KINGSTON, WILTSHIRE

Photo: L. V. Grinnell

polished. Holes were bored for the hafting of handles, probably by rubbing with a stick and a mixture of sand and water. Volcanic rocks were used for the larger axes, and deer-horn picks were also utilized. Of the flint implements, the larger ones were made from the core of the flint nodules,

chalk cliffs between Dover and Folkestone, which, perhaps, at this period, were still joined to the continent of Europe by an isthmus. Later, they entered, also, at the point where the chalk comes down to the Wash at Hunstanton. To them is due the blazing of historic trackways. The



PREHISTORIC BRITAIN

1. The Ridgeway on the Berkshire Downs, one of the historic trackways of the South. 2. Silbury Hill, Wiltshire, the largest artificial hill in Europe. The date of its construction is unknown. 3. Lynchets (cultivated terraces) at Bishopstone. 4. One of the dewponds at Chanctonbury, Sussex. 5. Waveland's Smithy, a chambered barrow on the Berkshire Downs. 6. The White Horse of Uffington, on the Berkshire Downs, thought to indicate a cult of Nature worship.

Major G. W. G. Allen, L. V. Grinnell



LIDDINGTON CASTLE, WILTSHIRE

The bank and ditch of this early Iron Age hill-fort can be seen.

Photo: L. V. Grinsell

Pilgrims' Way extends along the southern slopes of the North Downs, from the coast to Salisbury Plain. It is definitely to be attributed to this period rather than to that of the Canterbury Pilgrims, who only used the already existing road. Similarly, another track was blazed along the northern slopes of the chalk hills—the Icknield Way—from the Wash, along the East Anglian Heights,



STONEHENGE, WILTSHIRE

Photo: Taylor

the Chiltern Hills and the Berkshire Downs, to the Marlborough Downs. The Ridgeway, along the summit of the Berkshire Downs, and the South Downs trackway are probably of similar date.

Salisbury Plain became the centre of this civilization, with other trackways radiating westward and northward from it, over the Blackdown Hills into Devonshire, across the Dorset Heights and over the Cotswolds. Bodmin Moor, Dartmoor and the Pennines are other districts which furnish evidence of the people.

It is principally along the line of these

trackways that we find the standing stone monuments, the hill-top fortresses and the barrows which are our chief links with Britain's prehistory. Stone monuments fall into three principal groups—single standing stones, which are probably monuments erected in memory of a victory or of a fallen chieftain; stone circles, which are frequently of a religious origin and may mark the sites of primitive temples; and table stones—two or more uprights supporting a transverse slab, which are the cists in which the tribal leaders were buried. These last are always associated with long or round barrows or burial mounds of ovoid shape, the earth having been washed away or removed by farmers in the course of levelling the field. Kit's Coty in Kent and Wayland's Smithy in Berkshire are typical examples. Stone Circles are numerous and mostly simple, in the form of the Rollright Stones of Oxfordshire, reaching their highest development in Stonehenge, the best known Megalithic stone circle of Britain, which is, however, exceeded in size by those of Avebury and Stanton Drew.

Stonehenge is attributed to the extreme end of the Neolithic Period after the year 2000 B.C. The organization necessary to erect such a structure proves an advanced state of tribal life and internal order. Well attested theories indicate a cult of sun-worship, whilst Nature-worship is also indicated by some of the figures cut in the downs, by the White Horse of the Berkshire Downs, by the Giant of Cerne Abbas, and the Long Man of Wilmington. Each of the latter two is presumed to be an emblem of fertility. These hill figures may, however, belong to the early Iron Age or even later.

Neolithic man, in addition to domesticating the ox, was the first to attempt

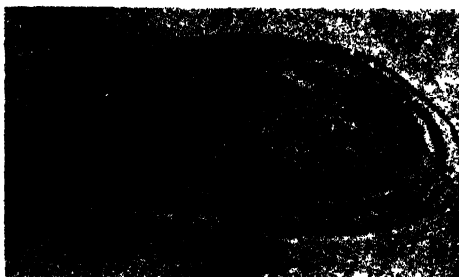
cultivation, as evidenced by the lynchets or cultivation terraces in many parts of the chalk country.

The earliest of the hill-top fortresses or camps are attributed to the New Stone Age, and may be traced in various stages of development from that time to the coming of the Romans. The earliest type was a simple circular rampart and ditch which was the home of a small tribe and an enclosure for cattle. Circular depressions in the earth within the enclosure, known as hut circles, indicate primitive dwelling-places formed by excavating a hole in the earth which when thatched over would yield moderate shelter. Later types include triple ramparts and ditches with cunningly concealed entrances, such as at Maiden Castle in Dorsetshire and British Camp on the Malvern Hills. Some of these were developed from existing entrenchments, but some were founded on new sites, whilst a few were superimposed on the Neolithic camps. In many continuous usage is indicated.

The later types were developed by the iron-using civilization which succeeded that of the Bronze people between the sixth and fifth centuries B.C. and which was flourishing at the time when the Roman expedition was made (see BRITISH HISTORY). At approximately the same time as bronze was introduced, another immigration was made by a people known as the beaker people, called by that name through the "beaker" pottery discovered particularly in eastern districts of England.

The principal visible remains of the Bronze Age in Britain are the burial mounds, found

ments of boats and chariots indicate an advanced state of civilization quite out of accord with the contemporary Roman account of primitive people whose chief characteristics were their barbaric appearance and attire. Little is known of the Druid religion, which was of Gallic origin,



YARNBURY CAMP

Photo: Major G. W. G. Allen

but which undoubtedly had much influence at this time.

PRELUDE. A musical term. Originally the bout of free improvisation with which early lute players and others were accustomed to warm themselves up before seriously starting to play, as is still customary in the East. Later, a similar free preparation to introduce the key of the piece to be played. Finally, the prelude became a set piece in its own right, but serving the same function (as in the famous Preludes and Fugues of J. S. Bach); or even standing as a separate composition.

PREMIER. The minister at the head of the Cabinet in Britain and other members of the British Commonwealth of Nations. His official title is Prime Minister. The corresponding official in France and in most other European countries having constitutional governments also bears the title Premier, in Germany and Austria, the corresponding office is that of Chancellor, which carries with it more or less of dictatorial power. The Premier, as chief of the Cabinet, is responsible to the legislative body, or Parliament, and holds office only so long as the party he represents is in power. In case of defeat of the government on any important legislative matter, the Premier resigns with his Cabinet, and, in Great Britain and the self-governing states of the Empire, a new election is held. In France and many other foreign states the leader of the opposition party is usually invited by the sovereign or President to form a Ministry. In Canada and other self-governing units of the British Commonwealth, the Governor-General has the power of appointment. The Premier must be a



ALIGNMENT AT MERRIVALE, DARTMOOR

Photo: Taylor

in much larger numbers than the long barrows of the Neolithic people, whilst the line of a typical settlement of the Iron Age has been well reconstructed from the lake village discovered at Meare and Glastonbury. Ploughshares, fine specimens of Celtic art and enamel work, currency bars and frag-

Member of Parliament, and he is directly responsible to the legislative body and to the people.

The title "Prime Minister" was not officially recognized in Great Britain until 1905, when he was made the fourth person in the realm. He receives no salary as such, but holds another office of profit (usually that of First Lord of the Treasury at £5000 per annum). Following the precedent established by Sir Robert Peel in 1834, the Premier has the power to choose his Ministers and to dismiss them. He is expected to keep a watch over all Government departments and to sponsor all proposed legislation which is introduced into Parliament as Government measures. His official town residence is No. 10 Downing Street, London, within easy reach of the Houses of Parliament, and here the Cabinet frequently meets. His official country residence is Chequers Court, Buckinghamshire.

See BRITISH CONSTITUTION: CABINET; PARLIAMENT

PREMIUM. See INSURANCE.

PREPOSITION, *prep* o zish' un. A part of speech which does the work of a connective or "relation word," in that it indicates the relation existing between a noun or noun-equivalent and some other word in the sentence.

Examples:

The book is { *on* the table
in the cupboard
under the papers.

Among the long list of simple prepositions in common use may be mentioned *at*, *by*, *against*, *above*, *on*, *upon*, *from*, *without*, *under*, *over*, *in*, *through*, and *during*; and among the phrase prepositions, such expressions as *according to*, *on account of*, *corresponding to*, *by means of*, *by way of*, *for the sake of*, *instead of*, and the like.

A preposition, together with the noun or noun-equivalent which follows it, and which it is said to "govern," forms an adjective, or adverb-phrase. See PHRASE.

It is important to observe the correct preposition used idiomatically with particular words, e.g. to be immune *from* a disease; to be oblivious *of* someone's presence; to concur *in* an opinion.

The importance of prepositions has been increased by the extraordinary variety and flexibility of meaning they have come to acquire as the language has developed. The ordinary relations denoted are those of time, direction, position, cause, agency, purpose, manner, exclusion, separation, and so on; but a single preposition may denote a number of these different relations, depending upon the way in which it is used. The

common prepositions *for* and *of* have at least ten distinct meanings, and others have almost as varied an application.

PRE-RAPHAELITES, *pre raf' ay el ites*. A group of English writers and painters who sought to express in their work, and to restore to art, the simplicity, sincerity and spirituality that had characterized the painters before the time of Raphael. To this end they founded, in 1848, the Pre-Raphaelite Brotherhood, and for a time published an organ, *The Germ*, for the statement of their ideas. The leading spirit in the movement was the painter and poet Dante Gabriel Rossetti. Other prominent Pre-Raphaelites were Rossetti's brother, William Michael, and the painters John Everett Millais and William Holman Hunt. Their ideas had the warm sympathy of such influential men as John Ruskin, Edward Burne-Jones, and William Morris. Because the movement brought back to English painting the spiritual and poetic qualities it had lost, it had far reaching influence, which is felt even to-day. See PAINTING.

PREROGATIVE COURTS. The Courts set up by the King in his Council in exercise of the prerogative he enjoyed as the fountain of justice. They were regarded with suspicion by the courts of common law, in that they gave an outlet to the King's powers that had no constitutional bounds. The most important P.C. was the *Star Chamber*, an inner body of the Council whose object was defined in 1487 to be the suppression of certain crimes that could not effectively be dealt with by the ordinary courts. Other P.C.s. chiefly composed of Councillors were the *Courts of High Commission*, which had a discretionary power of fine and imprisonment in matters affecting religion, the *Court of Requests*, which heard "poor men's complaints", the *Court of Augmentations*, which dealt with confiscated monastic property; the *Court of First-fruits and Tenths*, which administered the dues that were diverted from the Pope to the King, and the *Court of Wards*, which organized the levying of the King's feudal tributes. The Archbishop of Canterbury held a P.C. for the disposal of disputes relating to wills, the jurisdiction of which was transferred in 1857 to the Probate Division of the High Court.

PREROGATIVE, ROYAL. A comprehensive name for those powers which, under the constitutions of all the countries of the British Empire, reside in the Crown, as distinct from the various departments of State. At one time all the powers of the State were centred in the King. He was the paramount Lord of all the land in the realm, the maker of laws, and the dispenser of

justice; he commanded the army and the navy, levied taxes to fill his own purse, and ordered all things in Church and State conformably to his sovereign will. By a gradual process of devolution, these immense powers have one by one been delegated to other bodies. Parliament now makes the laws, the Judges administer them, and Cabinet Ministers decide matters of policy. A few powers are still left to the King, and it is these which together make up the royal prerogative; but even these powers he is expected by constitutional usage to exercise only in accordance with the advice of his Ministers. Thus the King still has in theory a power of vetoing Bills passed by the Houses of Parliament, but in fact this has never been done since 1707. He also has the power of pardoning criminals, but this power is exercised for him by the Home Secretary. The King is the source of all public honours; he alone can bestow peerages and knight-hoods and other such distinctions. Here again it is the practice for the King to be guided by the recommendations of the Prime Minister. The British constitution being mainly unwritten, no one can define the precise extent of the royal prerogative. This fact has sometimes proved useful in emergencies, as it enables Ministers to act quickly in the name of the Crown without waiting for the slower machinery of Parliament. Thus in August, 1914, on the outbreak of war, all British ships in British territorial waters were immediately requisitioned by the Government acting under the prerogative; later on in the war, the ample powers conferred on the executive by Parliament rendered any further recourse to the prerogative unnecessary.

PRESBYTERIAN CHURCH. Presbyterianism, in its widest sense, is the form of Church government which takes a middle position between Episcopacy, on the one hand, where authority is in the hands of the Bishops, and on the other Congregationalism, where authority lies with individual congregations. Presbyterianism holds the theory that all clergy are spiritually the equals of one another, and that the power of church government resides in elected bodies consisting of lay and ordained elders. It claims that this form of church polity is in accordance with the practice of the Apostolic age, as indicated in the New Testament.

In detail the Presbyterian constitution is as follows. The Presbyters or elders are elected by the congregations and are entrusted with the spiritual oversight of their churches. Deacons, or trustees, look after finances and the poor. A pastor and his elders constitute the *session* of an individual church, which is under control of a

presbytery composed of the ministers and one or more elders from each church in a given district. The presbyteries combine to form a *synod*, which, too, is a representative body consisting of ministers and elders chosen from the presbyteries; in some cases of all members. Controlling all is the General Assembly, to which appeals and complaints may be carried from the lower bodies when it meets, once a year. Presbyterian doctrine, in general, is strongly Calvinistic, though, in more recent times, the harsher features of Calvinistic theology, such as the doctrines of total depravity and limited redemption, have been largely modified. The controlling idea is the absolute sovereignty of God, and the supreme standard of belief is the Holy Bible. The sole requirement for membership is a credible profession of faith in Jesus Christ, and of obedience to Him.

The form of worship is simple. Pastors exercise no priestly functions, and only two sacraments—baptism and the Lord's Supper—are observed. Scripture-reading, prayer, singing of hymns, and preaching constitute the usual service.

History. At the time of the Reformation in the sixteenth century, John Calvin organized what he called the Reformed Church, at Geneva, on the Presbyterian system, and therefore Presbyterianism owes its origin to him. The Swiss and Dutch Reformed Churches, some German Reformed Churches, the Huguenots in France, and the Bohemian and Hungarian Churches, called by their national names, are all Presbyterian in constitution and theology. But the actual name, Presbyterian Church, is limited to the Scottish and English churches, and to those in America and the Colonies, which are derived from them.

Of these, John Knox, who lived for a time with Calvin at Geneva, is the father.

In 1560, acting under Knox's influence, the Scottish Parliament established the Kirk, or Church of Scotland (see CHURCH OF SCOTLAND), and ever since that time the Presbyterian form of polity and worship has had a principal and continuous hold upon the religious allegiance of the Scottish people. Through Scottish influence it took root in England, where the first English Presbytery was formed in 1562 in the reign of Elizabeth.

After a period of growth in the early seventeenth century, Presbyterianism declined in England after the Restoration of Charles II, but revived again in the latter half of the nineteenth century. There is now an active and flourishing Presbyterian Church of England, the association between the Scottish and English Churches having been drawn very close. Presbyterianism is fairly

strong in Northern Ireland and the Colonies, and especially so in the United States, where it has two million adherents. Its communicants throughout the English-speaking world number about five millions.

PRESCOTT, WILLIAM HICKLING (1796-1859). An American historian, born at Salem, Massachusetts, and educated at Harvard. His narrative histories of Spain in the zenith of her power and of her conquests in the New World have become well known, in particular *The Conquest of Mexico* (1843) and *The Conquest of Peru* (1847). Without great scholarship, and sometimes sacrificing accuracy to picturesqueness of detail, Prescott had a great power of investing the facts of history with life and movement. His influence in America has been similar to that of Macaulay in England, and his writings rank high among historical classics.

PRESCRIPTION. In law, the acquisition of a title to property or some other legal right by long and uninterrupted enjoyment (As to acquiring a title to property see LIMITATIONS, STATUTES OF.) The word "prescription" in English law is used only in connection with *easements* (which see), i.e. such rights as a right of way, or a right to have the flow of light or air to one's window unobstructed. Under an Act of 1832, where A has a window looking on to B's land, and that window has had access to the sunlight for twenty years or more continuously, it is an *ancient light* and B cannot then put up a building which will overshadow it, unless B has abstained from building during those twenty years in pursuance of a written agreement between A and B. In the case of other easements, the provisions of the Act are more complicated.

PRESCRIPTIONS. Written directions given by a physician to a chemist for the compounding of drugs, or for medicines already prepared, to be used by a patient. It is customary to write prescriptions in Latin, or to use abbreviations of Latin words. A prescription is usually preceded by the printed letter R with an oblique line running through it (℞). This is an abbreviation of the Latin word *Recipe*, "take"; it may also be a corruption of the sign of Jupiter, which was placed upon ancient prescriptions as a propitiation to the god, in the hope that the mixture would prove beneficial.

PRESERVATION. Process of saving animals, birds, etc., from extinction, exploitation or destruction. Taking first the case of animal life, we find that preservation may aim at saving an animal from extinction which would ruin the industry of which it is the mainstay. Whales, for instance, are preserved now, since it was found that their

uncontrolled slaughter was bringing them to the verge of extinction: and the game laws, applied both to fish and birds, are rather similar in their aims.

Other birds, such as the grebe and the egret, have been preserved to save them from commercial exploitation on account of public opinion, which condemned the cruelty practised in the collection of the feathers. In Africa and America, especially, there are huge areas in which all animal life is preserved, such places coming into being when the number of big-game hunters and traders threatened the extinction of valuable and interesting species. The bird sanctuaries of Britain have a similar aim, and recently great efforts have been made to preserve rare flowers and insects as well. Foxes, and to a less extent red deer, are preserved only to be hunted, but they would also become extinct if this were not the case.

In Britain, the preservation of stretches of country and of old buildings is in the hands of several bodies, such as the National Trust, which aim at saving the beauties of the country from the builder and the speculative landowner.

In many parts of England, especially on the East coast, the sea tends to encroach upon the land and it must be kept back by breakwaters, sea walls, dykes and other means.

The discovery of new countries in the West with the consequent emigration from Europe and the growth of great civilizations in the Americas, Australasia, etc., has made the position of the original inhabitants a difficult one. For the most part they have not been able to defend themselves against injustice and would inevitably have disappeared, or else have been absorbed into the general population, had not the various Governments appointed reservations, as is the case of the North American Indians where these peoples might carry on a life more natural to them.

PRESERVATION OF FOOD PRODUCTS.

Method of treating food to protect it from the action of fermentation, moulds and bacteria. Advantage is taken of the fact that ferments, moulds and bacteria cannot exist without a certain amount of moisture and air, and the preserving processes therefore consist either of drying, or of sealing the foodstuffs in an airtight container.

The drying of foodstuffs for their preservation has long been practised amongst ancient and primitive peoples, and the dried fruit trade in particular is now world-wide. The fruits may be dried either in the sun, or artificially. In the second method referred to above, the food is either canned—in metal containers—or bottled in special

preserving jars: there is scarcely any food that cannot now be had in a tinned state.

Other methods of preservation are by cold storage, suitable for meat, fresh fruit and flowers, and such special operations as the keeping of eggs in water-glass or lime-water.

Tinned food is cheaper than cold-storage food and has more nearly the flavour of the

The cold-water process is practicable only for fruits high in acid, such as gooseberries and rhubarb. Its application is so limited and its results so uncertain that it is little used. It consists simply in packing perfect, unbroken fruit into a jar, filling the jar to overflowing with cold, sterilized water, and sealing.

The cold-pack method has been in use by



ENGLISH PEA CANNING FACTORY

fresh product than has food that is dried. Any food product exposed to the air decomposes. This decomposition is caused by micro-organisms, which grow and multiply in the food. *Freezing*, as applied in cold-storage plant, arrests the activities of these organisms. *drying* retards their development in some products; *heat*, properly applied, kills them.

There are three methods of canning now in general use: (1) the hot-pack, or open-kettle, method; (2) the cold-water method. (3) the cold-pack method.

In the hot-pack or open-kettle method, the food is boiled or sterilized in one kettle; the jars, caps, and rubbers, in another. Then the sterilized food is ladled into the sterilized jars and the jars sealed. This method is occasionally unsuccessful when a spore or organism from the air is ladled into the jar with the food, and decomposition results.

commercial canners for years, but it has more recently been made available for housewives.

The most common type of container used in the work is a kind of glass jar. This jar has a zinc or aluminum screw top, with a rubber ring that fits between the glass and the top, the rubber makes the container airtight when the top is screwed tight on the jar. The glass top jar permits no food to come in contact with metal, and is considered a little more sanitary than the zinc-top container. Besides the rubber ring a clamp spring is provided that may be tightened as soon as sterilization is complete.

The vacuum jar, another type of container in common use, has a metal top coated with gold lacquer and provided with a vegetable-fibre ring attached to the metal top. Where food products are packed by



MOVING-BELT MACHINERY IN CANNING FACTORY

commercial concerns, tin cans are commonly used. These cans are often classified as "packers' cans," with solder-hemmed caps, and "sanitary cans," which are hermetically sealed by machines especially made for the purpose.

Small sealing outfits may be purchased for use in the home.

In the cold-pack method, the uncooked or partially cooked food is packed in the jars, and the food is then processed or sterilized by use of one of the three following methods: (1) the water bath; (2) the oven; (3) the pressure cooker.

In all cold-pack canning, the jars should be filled to within 1 in. of the top. This method allows for expansion of the liquid and prevents boiling over.

PRESIDENT. One who presides over a group of persons, who may be a society, council, board, etc.—the equivalent of "chairman." In fact, the presiding officer of American trading corporations is known as the "president," English companies preferring the title "chairman." It is also the title given to the chief executive officer of a Republic, e.g. France, the U.S.A., Poland, Argentina, etc. He acts as head of the State as does the Crown in a monarchy, except that the appointment is usually not for life but only for the term specified in the Constitution, e.g. in the U.S.A. he sits for four years.

PRESS, LIBERTY OF THE. In times of peace, all liberal governments give their citizens the right to publish anything they choose, making them responsible under the law of libel for issuing false statements, and under the criminal law for publishing obscene matter. This privilege, known as *liberty of the press*, is one of the fundamental

rights of the people of democratic nations, and it has been won, like other common rights, after centuries of struggle. In some countries, the right to criticize the policies of the government or of high officials is greatly curtailed, even in time of peace. Examples may be found in Italy, Germany and Soviet Russia. Probably the greatest liberty of the press is found in the English-speaking countries—the British Commonwealth of Nations and the United States. See **LIBEL**; **NEWSPAPERS**.

PRESSBURG. See **CZECHOSLOVAKIA**.

PRESS GANG. A commission of officers and men charged with compelling the enlistment or impressment of able-bodied subjects. Impressment is the prerogative right of the Crown to enlist in the army men chosen at will, and in the navy sailors of ages between 18 and 45 who have spent two years at sea. Commissions of Array were granted as early as 1282 to royal officers with a view to strengthening the national fyrd, or army, in time of war. In relation to the navy, this right of the Crown has never seriously been questioned, and the Crimean War was the first in which the English fleet was not manned by impressment. Since 1641, however, impressment for the army by royal prerogative has not been exercised.

PRESSURE GAUGE. In general any instrument which records pressure. The barometer (which see) is a typical instance. The term is also applied to specialized instruments for measuring extremes of pressure of gases or liquids. In one type of gauge—the Bourdon—a tube of elliptical cross-section is used. This is fastened at one end to a block, through which the gas or liquid of which the pressure is to be determined is introduced into the tube.

The other end of the tube is sealed and attached-through gearing to a pointer which is free to move over a graduated scale. The pressure of the gas or liquid in the tube changes the cross-section of the latter from elliptical to circular; consequently the tube uncurls in greater or less degree and so moves the pointer. The tube usually is made of bronze, but, if the gauge is for use with high pressures, steel is employed because it is less affected by high temperature and is also more elastic. Sometimes it is necessary for special construction of the gauge as some gases—notably oxygen—tend to set up corrosive action.

PRESTEIGN, *pres teen'*. County town of Radnorshire (which see)

PRESTER JOHN. A legendary Christian priest and king, whose history is somewhat obscure. He is supposed to have lived in the twelfth century and to have ruled over a vast domain in the Far East, beyond Persia and Arabia. Later, he was identified with the King of Ethiopia, perhaps because early writers often confused India with Ethiopia.

The title means *presbyter* or *priest*, and the history of Prester John especially emphasizes his religious character. He was considered the greatest Christian monarch in the world, and the wonders of his empire impressed the thought of Europe for two centuries.

The first mention of Prester John is in an account by Bishop Otto of Freisingen. This chronicle relates that "Presbyter" John had

fought the kings of the Medes and the Persians in order to conquer them for the true faith, and it describes at some length the wealth and power of the great king and priest. His reputation was further enhanced by a letter sent to the Emperor Manuel I of the Byzantine Empire, in which the writer, signing himself "Presbyter Joannes," described the richness of his realm and expressed his desire to visit the Holy Sepulchre, accompanied by a great army of his followers. Other references to Prester John are made in the tales of various travelers, including Marco Polo, who identifies him with the king of a powerful tribe in Mongolia.

By the fifteenth century, the name disappears from Asiatic history, and Prester John begins to be heard of as an African prince.

PRESTON. This County Borough and manufacturing centre of Lancashire, with an area of 5757 acres (1935) and a population of 118,839 in 1931 (estimated 116,200, 1935), is an important centre on the L.M.S.R., 209 miles from London, with connections to most of the important towns of Lancashire and Yorkshire. The Ribble Navigation and Preston Dock undertaking provides a 40 acre dock and an access 15 miles long from the sea to the dock. The imports from abroad consist mainly of wood pulp, timber, esparto grass, pyrites, salt, petrol, etc., and from coast-wise ports china clay, slate, macadam and grain. The exports consist of coal, coke,



PRESTON DOCKS

Photo: Preston Corporation

pitch, scrap iron and general goods. In addition, there are regular coast-wise steamer services to and from Dublin and Belfast, and also regular services to Norway, Sweden, Germany and Finland.

Cotton-spinning and manufacturing are the most important of the town's present-day industries, whilst a recent innovation in this direction has been the introduction of the manufacture of artificial silk goods. Engineering in all its branches is carried on extensively. This includes the manufacture of printing machinery, steel power hammers and various articles for the fitting out of ships and motor-cars. Among other



EFFECT OF PREVAILING WINDS

Where strong winds predominate from one quarter, trees in exposed positions are generally bent over in the direction of the wind. This is noticeable in Scotland, and even to some extent on the southern English hills.

Photo: Visual Education Service

manufactures are the making of rubber goods, paints, ropes and cables.

Preston is one of the oldest boroughs in the North of England and has had fifteen royal Charters granted to it, the first by Henry II in 1179. In 1330 it became the seat of civil jurisdiction in Lancashire and also the seat of the Palatine Courts. The first Members appear to have been returned to Parliament about 1295. Sixteenth-century linen-working was followed by extensive cotton operations from the middle of the eighteenth century, Sir Richard Arkwright being particularly associated with the town. Since that time Preston's industrial prosperity has been assured.

Preston is now the administrative centre of Lancashire.

PRESTONPANS, BATTLE OF. See STUART, CHARLES EDWARD.

PRESTWICK. See AYRSHIRE.

PRETENDER. See STUART, CHARLES EDWARD; STUART, HOUSE OF.

PRETORIA, *pre tor' ia*. The seat of government of the Union of South Africa and the capital of the Transvaal province, situated 46 miles by rail north-east of Johannesburg. It occupies both banks of the Aapies, a branch of the Limpopo, and is 4470 ft. above the sea. Pretoria was founded in 1855, and was named after Andries Pretorius, a Dutch leader. When the Union of South Africa was constituted in 1909, Pretoria and Cape Town were rivals for the honour of being named the capital; this matter was adjusted by making Pretoria the seat of administration and Cape Town the seat of the Parliament. In 1931 the total European population was 62,138. See UNION OF SOUTH AFRICA.

PREVAILING WESTERLIES.

The prevailing winds that blow over the North and South Temperate Zones in a westerly direction. In the southern hemisphere the prevailing westerlies attain such force and velocity on the sea that the sailors call them the "roaring forties." Owing to the great land masses in the northern hemisphere, the prevailing westerlies of the North Temperate Zone are frequently diverted from their course by mountain ranges and other causes. They are also interrupted by the great cyclonic storms that are common over land and sea in this zone.

Aviation is greatly influenced by these winds, flying from west to east is much easier than from east to west. Heavy winds blowing east-

ward have made aeroplane flights from Europe to America particularly hazardous. See TRADE WINDS; WIND.

PRIAM. In Greek legend, the last king of Troy and son of Laomedon. Priam had nineteen sons by his second wife, Hecuba, and in all was the father of fifty sons and fifty daughters. Cassandra and Polyxena were among his daughters, and Hector and Paris the most famous of his sons.

During the siege of Troy, Priam saw most of his sons killed in the defence of their city. When Troy fell into the hands of the Greeks, Priam was killed by Neoptolemus, the son of Achilles, at the altar of Zeus, to which he had fled for protection. See TROY.

PRIBILOF, pre' bil of, ISLANDS. A group of islands important as the home of the fur seal, situated in the Bering Sea, 200 miles from the Alaskan mainland. St. Paul and St. George are the largest of the group; their areas are 35 and 25 square

miles respectively. The islands have been officially a fur-seal reserve since 1868. The herd consists of about 900,000 animals.



PRICE. The statement of value, in the normal currency of the day, of the exchange value of a commodity. Generally prices of commodities depend on the law of supply and demand, though there are to-day many national and international schemes for the maintenance of price above certain levels. Prices, it should also be remembered, vary just as they do because of the variations in the supplies of commodities. Prices can be forced up by inflation, or forced down by deflation, by those who control monetary policy. The course of prices is closely watched, so that wide fluctuations may be avoided and so that the exchange value of one commodity can be examined in relation to the value of things in general. For this purpose elaborate price-index systems have been devised. Cost price of an article is usually accepted to be the manufacturer's price before the article is passed on to a retailer.

PRICE MAINTENANCE. It is a widespread and growing practice among producers to fix prices of their goods, and to impose conditions upon retailers obliging them to sell at the fixed prices. The producers enforce their conditions by the threat of boycott; and since their "branded" or "proprietary" goods now constitute the greater part of the retailer's market, the threat is usually effective in preventing "price-cutting." Whether we buy in the city or the suburbs, whether in town or country, we may expect uniform prices. It is only in fashion goods, drapery and clothing, and highly perishable goods like fresh fish and cut flowers that the uniform price system has made little progress.

The system is not to any real extent directed to the imposition of excessive

prices upon the public. Where, indeed, a monopoly exists, the uneasy suspicion may arise that the taxing of the public is the primary purpose. In the main, however, the attempt to prevent price-cutting arises from the fact that such price-cutting plays havoc with the sales organization. The branded goods have been widely advertised at specified prices. To sell them at abnormally low prices in order to attract customers to buy other goods tends to disorganize and antagonize the retail trade. Shopkeepers in the neighbourhood of price-cutters may cease to stock the goods affected. At any rate they cease to push the goods; and manufacturers find their sales dropping. Later, the price-cutters themselves, finding that the goods are no longer effective as a decoy, may cease to stock them.

In large-scale industry, there have been from time to time successful agreements on the part of producers to improve and to maintain prices. Often such agreements have been world-wide in character, and there are in existence to-day international agreements regulating the output of such commodities as tin, rubber, etc., so as to maintain prices at a level that is considered remunerative to the producers. In addition, many countries have adopted devices such as tariffs, marketing schemes, etc., to improve and keep up prices. Especially in the United States many important experiments have been made in price regulation. Most of these efforts, similar to the experiments in Great Britain, are a reaction to the collapse in prices experienced between 1930 and 1932.

There is a school of thought that contends that it is unsound to interfere artificially with prices which, so they say, should be allowed to find their own level. It is argued that if prices fall, it will cease to be economic to produce the articles concerned, a scarcity will then result and prices will automatically restore themselves. In the same way, if a commodity commands a high price, there will be an increase in the output of that commodity, tending towards a glut, which will automatically bring the price down.

PRICKLY ASH. An American tree of the Ash family which is garnished with thorns, produced as those on rose-bushes, it is aromatic, and bears yellow flowers at the appearance of the pinnate leaves characteristic of the family.

Scientific Name. *Zanthoxylum fraxineum*.

PRICKLY HEAT. A form of Urticaria, or nettle-rash (which see), arising from profuse perspiration, and accompanied by excessive itching, often in persons who have been debilitated by some serious illness in hot climates. The condition may be relieved by

patting the skin with methylated spirit one part with three parts of water, or with two drops of carbolic acid in an ounce of lime water, and afterwards dusting with talcum powder.

PRICKLY PEAR. Common names of a genus of plants belonging to the cactus family, native to America, most of which bear a prickly, edible fruit, resembling a pear or fig. Spineless varieties, found naturally or produced by breeding, are used especially as food for cattle. The prickly pear has been introduced into the Mediterranean countries, where it is cultivated for its fruit, and into Australia, where it has become a pest. Its roots penetrate rocky crevices and make barren soil suitable for vegetation of other kinds. See CACTUS.

Scientific Names. The cactus family is known scientifically as *Cactaceae*. The plants called prickly pear constitute the genus *Opuntia*. The common species is *O. vulgaris*.

PRIDE'S PURGE. See RUMP PARLIAMENT.

PRIEST. The term, etymologically connected with the Greek *presbyteros* (presbyter or elder), now has the meaning of the Latin *sacerdos*, i.e. a man whose vocation and office it is to offer divine worship to God on behalf of the community, and in particular to offer sacrifice. His function is thus essentially that of mediator, a function which he exercises also inasmuch as he transmits to men the truths of religion by teaching. In some early forms of religion—including the Jewish in the Patriarchal age—the priestly office was fulfilled by the head of the family; in other cases—especially among the ancient Romans—the priests were State officials. Usually, however, they have formed a special caste or class: under the Mosaic dispensation the Jewish priesthood was reserved to the tribe of Levi. In the New Testament (Heb. v. 5 *seq.*) Christ appears as the High Priest who supplants all previous priesthoods. According to the teaching of all Episcopal churches (see EPISCOPAL CHURCH), the perennial priesthood of Christ is communicated by Him to chosen men through Ordination though the sacrificial function of the minister is not accepted by all.

This avoids the difficulty that some Episcopal Churches would not consider Ordination a "Sacrament."

PRIESTLEY, JOSEPH (1733-1804). English scientist and author. He studied for the ministry but was rejected because of certain doctrinal opinions. In 1767 he published the *History of Electricity*. He wrote many other books on scientific, philosophical, and controversial subjects.

Priestley was especially interested in "airs," or gases, and was the discoverer of

oxygen, which he made by heating red oxide of mercury. He called this gas "dephlogisticated air." The name "oxygen" was given it by Lavoisier, who carried farther, and theorized on, the work begun by Priestley, whose chief interest lay in experimentation.

Priestley's liberal ideas made him unpopular in England, and in 1794 he went to Pennsylvania, where he spent the rest of his life in chemical research.

PRIMARY COLOURS. See COLOUR; SPECTRUM ANALYSIS.

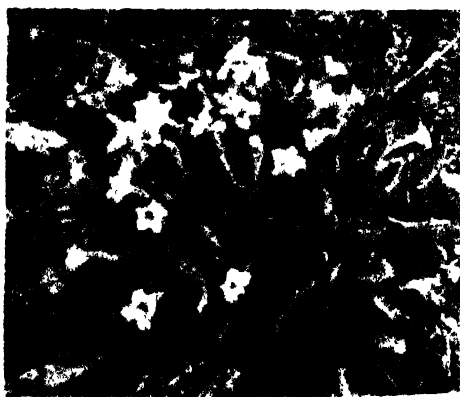
PRIMATES. The highest order in the animal kingdom. It includes man and those animals which are nearest to him in physical characteristics. The name is derived from the Latin *primus*, "first." Primates constitute the order *Anthropoidea* in the class, *Mammalia*. See ZOOLOGY.

PRIME MINISTER. See PREMIER.

PRIMO DE RIVERA. See RIVERA, PRIMO DE.

PRIMOGENITURE, *pri mo jen' it ure*. A rule of law which requires that the father's real estate be left to his eldest son, or to the latter's male heirs. The ancient peoples recognized some such procedure, but the term as now used describes a rule that grew out of the military necessities of the feudal period, when it was deemed expedient to strengthen the power of the son first able to bear arms for the king. Only when the male line was extinct did the property pass to the daughters. The rule survives in most monarchical European countries with respect to the succession to the throne, but as to property it was abolished in England in 1925.

PRIMROSE. The common name of a genus of early-blooming plants. Many of



THE COMMON PRIMROSE.
Photo: E. J. Hoehling

the cultivated varieties have been derived from the common primrose, a species that grows wild in woods and meadows of Europe.

and the British Isles. It has deeply veined leaves and yellowish-white blossoms, the latter borne singly on the flower stalks. Under cultivation it bears flowers of pure yellow, pink, lilac, and various shades of red, and single and double varieties. Primroses grown in the garden need shade and rich, moist loam, and the common primrose looks happiest not when planted in beds but under trees or on banks. The *polyanthus* in one or other of its kinds is a good plant for the herbaceous border or formal bed. It is a hybrid, possibly a cross between the primrose and the cowslip.

Scientific Names. Primroses constitute the genus *Primula* in the family *Primulaceae*. The common primrose is *P. vulgaris*. Closely related species are the cowslip (*P. officinalis*), and the oxlip (*P. elatior*). Among the greenhouse and window forms are the Chinese primrose, *P. sinensis*, and the Japanese, *P. obconica*. The so-called evening primrose belongs to another family. See COWSLIP; OXSLIP.

PRIMULA. The primrose is the best-known of the primula family, which also includes the cowslip, pimpernel, polyanthus, etc., this, the typical species, is described above, and other varieties will be found under their separate titles. The Auricula is a favourite border plant, having a great range in colours. The Bird's-eye primrose is also popular; the flowers are of a delicate lilac-pink with a yellow eye. The rock primulas include some delightful kinds, like the scented yellow "Dusty Miller" and the dwarf purple "Wanda" which often flowers profusely towards the end of a mild winter before the first spring bulbs appear. For growing in pots in a cool greenhouse there are few to equal *P. malacoides*, a species with rounded crinkled leaves and graceful pinky-lilac blossoms borne upon tall stems.

Scientific Names. Primulas are of the natural order *Primulaceae*. The primrose is *Primula vulgaris*; the auricula, *P. auricula*; Bird's-eye primrose, *P. farinosa*. The Chinese primrose (*P. sinensis*) is a popular greenhouse and window-plant. There are scores of other varieties.

PRINCE. From its Latin origin *princeps*, this word has derived its significance of "chief of a body of people," but in its particular applications the meaning of the term varies. The title is sometimes given to the ruler of a small territory, e.g. the Princes of India, but generally in Europe, and in Central Europe in particular, it has been a title of nobility assumed by large landowners. In some countries, however, it is the title given to the sons (and sometimes, grandsons) of kings or emperors, as in Britain, Belgium, Sweden, and the old German Empire, etc. "Prince Consort" is a title given to the husband of a queen who reigns in her own right; such

was Albert, husband of Queen Victoria of Britain.

PRINCE EDWARD ISLAND. The smallest province of the Dominion of Canada. It lies in the southern part of the Gulf of St. Lawrence. The island is 130 miles long, and has an average width of 30 miles. Its area is 2184 square miles. Fogs are much less common on Prince Edward Island than in Newfoundland and Nova Scotia, and the climate is milder than that of the nearby mainland.

Prince Edward Island, like Nova Scotia and New Brunswick, has suffered from heavy emigration to the Canadian Northwest. In fact, in the decades from 1901 to 1921, the population of the province decreased from 103,259 to 88,615; in 1931 it was 88,040. The density of population per square mile (40.31 in 1931) and the average number of persons to a family, 5.51, are greater than those of any other province. Most of the people are of British descent, but there are a few descendants of French Acadians. Charlottetown, the capital, has 12,357 inhabitants (1931).

Resources. At one time the entire island was covered with forests, of which between one-third and one-fourth remain. Birch, beech, maple, cedar, spruce and pine are the chief species of trees. Timber is still cut in considerable quantities.

It is noteworthy that of the 13,701 farms on the island, only 277 are occupied by tenants, the remainder being owned by the farmers. Practically the entire island, except certain areas of swampy land, is suitable for cultivation. The soil, a light loam, is covered in most places by a layer of decayed vegetable matter and itself rests on clay and sandstone. The fertility of the soil, especially since the introduction of co-operative dairying in 1891, has steadily improved, crops of grain equal in yield to those of any other province are grown, and potatoes and roots yield larger returns than elsewhere in the Dominion. Hay, oats, potatoes, and turnips are the principal field crops. Apples and strawberries are the chief fruits.

Mixed farming and dairying are carried on extensively in conjunction with pig-farming and poultry-keeping.

One of Prince Edward Island's industries—fur farming—was unique for a number of years, but has been copied in other provinces, and in various parts of the United States. The mainstay of the business is the silver fox. There are 848 fox farms. A single silver fox is valued at from £10 to £40. Sales of pelts and of foxes for breeding purposes average £200,000 per year. Other valuable fur-bearing animals, including the

beaver, mink, musk-rat, and skunk, are also being raised for their fur.

Although relatively a small part of the Dominion's fisheries, the Prince Edward Island fisheries are of great value in proportion to the population of the province. Lobster averages 60 per cent of the value of the catch; other important fisheries are of cod, herring, oysters, smelts, and mackerel. The oyster beds have recently been extended

When Prince Edward Island entered the Confederation in 1873, it was allowed six members in the House of Commons; this number was reduced to four in 1901.

History. It is possible that the island was seen by Cabot in 1497, but the first white man known to have visited it was Jacques Cartier, the French explorer, who came in 1534. Cartier, however, thought it a part of the mainland. In 1603 Champlain took



CHARLOTTETOWN, PRINCE EDWARD ISLAND

Courtesy, Canadian Royal Air Force

to over 20,000 acres, eventually to be increased to nearly twice that area. The packing or preserving of fish is an important branch of industry.

Education and Government. The public school system of the province was established in 1852; since that date, elementary education has been free. There are two colleges: Prince of Wales College, and St Dunstan's, a Roman Catholic institution. Both are at Charlottetown.

Prince Edward Island, like the other Canadian provinces, has as the titular head of its government the Lieutenant-Governor. The Legislative Assembly is composed of a single house of thirty members. Women are eligible for election. The province is divided into three counties of nearly equal size, the county towns of which are Summerside, Charlottetown and Georgetown.

possession of the island for the King of France.

In 1763 the island, together with the remainder of French Canada, passed formally under British rule, and for the first ten years was administered through Nova Scotia; the first parliament under the separate government met in 1773. In 1767 the island was divided into townships of 20,000 acres each. These were granted in many cases to speculators and other non-residents who had more or less shadowy claims on the British government's generosity. Thus it happened that Prince Edward Island suffered for a century (until 1876) from absentee landlordism. In 1769 the island became a separate colony.

At Charlottetown was held in 1864 the important conference which paved the way for Confederation, but the colony refused to join the Dominion until 1873.

The province has long been interested in securing a tunnel under Northumberland Strait from Cape Traverse to the mainland, but the Dominion government has not yet agreed to its construction. The Dominion government does, however, operate the Prince Edward Island Railway as a branch of the Intercolonial Railway, and a train ferry steamer connects the island railway with the Canadian National on the mainland. The total railway mileage of the province was 286 miles in 1931.

PRINCE OF WALES. In the days of Welsh independence or semi-dependence, there were various princely houses, controlling now more, now less of the country, but never one Prince of Wales. The title was first conferred by Edward I on his eldest surviving son Edward of Caernarvon. Legend says that he presented to the Welsh his infant son, "a Prince who speaks no word of the English tongue and hath done harm to none." Whether legend be true or not, Edward II was not granted the official title until 1301.

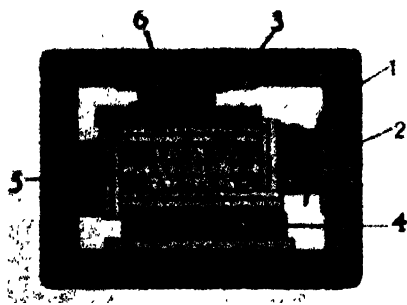
The title was subsequently conferred on the eldest son of the sovereign, but not usually in extreme youth. Responsibility for the welfare of the Principality was not long connected with the title. Henry V when Prince of Wales spent much of his youth suppressing the insurrection of Glendower, but this was an exception. George V when Prince of Wales added the Red Dragon of Wales to his heraldic badges, Edward VIII was the first Prince of Wales to address his subjects in Welsh on his installation.

PRINTING. While the Chinese used printing hundreds of years before it was used elsewhere, its history, as far as it concerns us, dates from about 1450, when Johannes Gutenberg began printing from movable type in Mainz, Germany. There are some who claim that Lourens Coster, of Holland, was the real inventor of the process, but Gutenberg developed it to the point where it could be used to produce artistic and readable, as well as relatively inexpensive, books. From Germany the art quickly spread into Italy, France and Spain, and in 1476 William Caxton introduced it into England. His first published book was *The Dictes and Sayenges of the Philosophers*, though earlier he had printed an "Indulgence" for the Benedictine monks. Many of Caxton's type faces are used to-day in modernized form.

Typesetting. The first step in producing printed matter, known as *composition*, consists in setting up the type to form words, and spacing these words into lines of equal length. Type is made of lead, mixed with tin and antimony to harden it, and is cast

in the form of thin stamps about an inch long, and wide and thick enough for the letter which appears at one end. See **TYPE**.

To set type by hand, the *compositor*, or typesetter, stands before the *case*—a shallow wooden box, divided into as many compartments as there are letters and characters; he picks out the letters one at a time, and sets them in order in a small metal frame called a *stick*, which he holds in his left hand. As each line is set up, he spaces it out by inserting thin strips of metal between the words so that each line is the exact length of the stick. When ten or fifteen lines have been



SMALL JOB FORME READY FOR THE PRESS

1 The chase, a metal frame capable of resisting pressure. 2 Quoins, or locks. 3. Wood strip, or reglet, to help fill space between type forme and the chase. 4 Metal furniture, used for same purpose as the reglet. 5. Bearers, metal strips, laid by the side of the type. 6 The type forme.

set in this manner, the stick is full and the type is transferred to the *galley*, a shallow metal tray slightly wider than the column of type and fitted with langes on two or three sides. This process is repeated until the galley is full or the whole article has been set up.

Proof Reading. The type is then inked and an impression is made upon a long strip of paper. This is called the *galley proof*. It is given to the proof reader, who compares it with the original manuscript (called the *copy*). All the errors which the proof reader finds are marked on the margin of the galley proof, which is given back to the compositor, who corrects the errors. "Clean" proofs may be taken at this stage and sent out to an author.

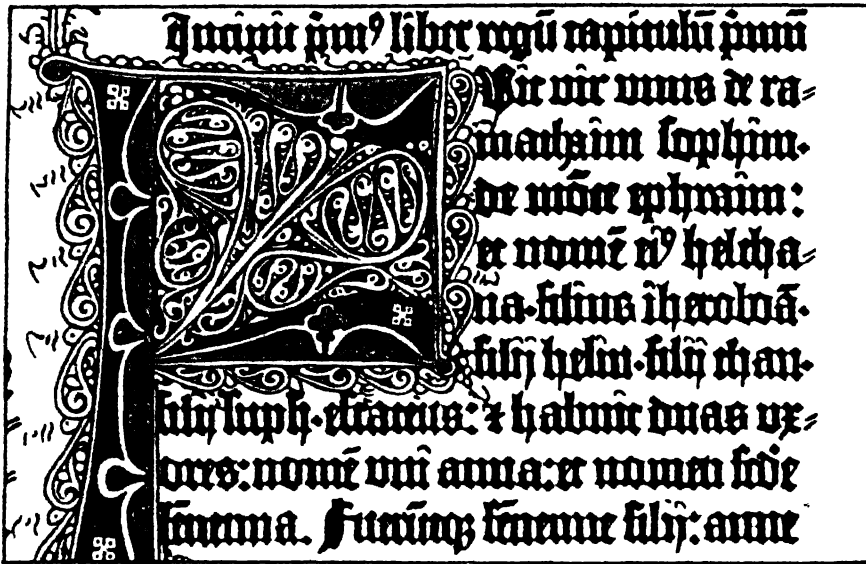
Hand composition was the only method used until about 1890. It is still used in setting advertisements containing a great variety of sizes and styles of type, and also for similar work which cannot be produced by machines. Practically all books, magazines, and newspapers are now set up on either the *linotype*, which casts type from

brass matrices in the form of a slug (or "line o' type"), or on the *monotype*, which casts and sets up the characters one at a time. See **LINOTYPE**; **MONOTYPE**.

Make-up. The type, whether set by machine or by hand, is next made up into pages. The printer takes enough type from the galley to make a page, adds whatever is needed in the way of a heading, a page number (*folio*), rules, photo-engravings, ornaments, etc.; and spaces the combination to the correct length by inserting strips of metal.

soft material (wax or paper pulp) and using the mould thus produced to make metal plates which are exact duplicates of the surface of the original type.

If plates are made, they are arranged, like the type pages, so that the pages will come in the correct order when the sheet is folded. As many as sixty-four pages may be printed on a single sheet of paper, but thirty-two is a more usual number. The group of type pages or plates so arranged is called a *forme*, and the group of pages which results when the



BIBLE OF 1455

Actual size reproduction of a work printed by Gutenberg, Fust, or Schoeffer. The original is in the British Museum.

Photo: British Museum

Lockup. The pages (from which page proofs may, again, be taken and sent to the customer for his approval) are next locked up in iron frames (*chases*), in which the type is held tightly by means of wooden blocks (*furniture*) and iron wedges (*quoins*).

If the job is to be printed from the type, which is done if only a few thousand copies are wanted, a number of pages are locked in one large *chase*, the pages being arranged so that when they are all printed on one sheet of paper and that sheet folded, the pages will be in the right order. If, however, the work to be printed is a great newspaper or some popular book or magazine, of which several hundred thousand copies may be required, the pages are locked in smaller chases holding only one to four pages, and are then electrotyped or stereotyped (see **ELECTROTYPE**; **STEREOTYPE**); that is, the type is duplicated by pressing it into a

sheet has been folded is known as a *signature*. (In this set of books, signature numbers appear on every seventeenth page. See pages 3537, 3553, etc.)

Presswork. The printing press is merely an arrangement for pressing the paper firmly against the inked surface of the type. In the early presses, the ink (a thick compound of linseed oil and lampblack) was applied by hand, a sheet of dampened paper laid on the inked forme, the pressure applied, and the sheet removed by hand; this was a slow and laborious process. In the modern press, the ink is automatically applied by rollers, the paper is fed in mechanically, the pressure is applied by substantial steel cylinders, driven by electricity, and the sheets are removed and (in many cases) folded mechanically at high speed, with very little attention. See **PRINTING PRESS**.

Illustrations. Pictures are reproduced by

a number of methods. The earliest process was the woodcut, which was made simply by drawing the picture on a smooth block of wood and then cutting away the parts which it was wished to have white in the finished print. When this block was inked and pressed against the paper, the raised parts printed, reproducing the design. This process was raised to a very high state of perfection during the nineteenth century. To-day it is still employed by artists, but is of less commercial importance, having been almost everywhere replaced by photo-engraving.

Photo-engravings are made by producing, photographically, an acid-resisting image of the picture on the surface of a zinc or copper plate, which is then eaten away with acids to leave the picture in the form of a raised pattern. If the picture consists merely of solid black lines or masses on a pure white background, the engraving is called a *line block*, or *zinc etching*. If it is wished to reproduce greys of different shades, as well as black and white, the picture is broken up by a screen in the camera, so that the image on the copper plate used is a series of tiny dots, largest where the picture is darkest, smallest where the tints are lightest. The engraving is then usually known as a *half-tone*. Either "line" or half-tone may be used to produce coloured pictures, but if line blocks are used, it is necessary to use, as with woodcuts, one engraving for each colour.

With the half-tone plates, however, it is possible to reproduce any coloured object in three printings, by what is called the *three-colour* process. For this, three pictures are taken of the object to be reproduced, and by the use of colour screens in the camera, these are so taken that one of them is a picture of the reds, one a photograph of the blues, and one a photograph of the yellows. Half-tone plates are made of each of these, and are inked, one with red, one with blue, and one with yellow ink, and printed, one exactly on top of the other, on the same sheet of paper. A fourth plate, which is inked with black ink, is often added to give depth to the shadows and sharper outlines. It may, however, be omitted, and often is in cheaper work, as the red, blue, and yellow inks are capable of producing any colour, including black, by mixing in different proportions.

Other Printing Processes. While the processes described are those commonly employed to produce books and magazines, they are by no means the only ones. In

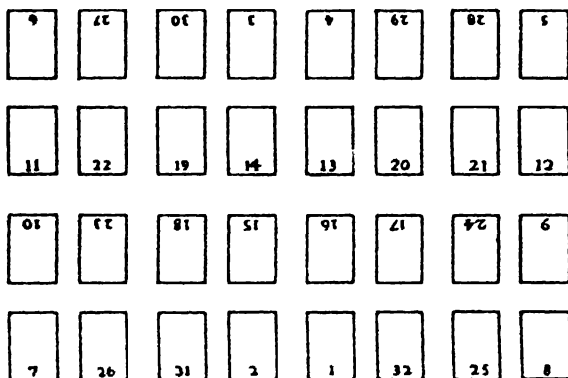
addition to the printing from raised surfaces (known as *letterpress* or *relief* printing), there are two other important classes: namely, *lithography* and *intaglio* or *gravure* printing.

Lithographic Printing is done from a flat surface of stone or a metal plate. See LITHOGRAPHY.

Intaglio Printing includes all forms of printing in which the ink is carried in pits or grooves in the surface of a smooth plate. An important process in this class is *photo-gravure* (which see).

PRINTING INK. See INK.

PRINTING PRESS. A printing press may be described as a piece of mechanism de-



HOW A FORME OF THIRTY-TWO PAGES IS PREPARED FOR THE PRESS

After this forme has been printed, the ink is allowed time to dry, and then the other side of the sheet is printed from the same forme. The sheet is next cut through the centre between pages 1 and 2, before folding. Therefore the sheet produces sixty-four printed pages, or two identical sets of a thirty-two page book.

signed to press a sheet of paper against an inked surface and thus produce an impression.

The earliest presses used by Gutenberg and his contemporaries were made entirely of wood, the pressure required being obtained by means of a screw. The formes of type or wood engraving to be printed were placed on the bed of the press and inked with a leather pad known as an ink ball; a sheet of damped paper was laid on the type or wood block; then the platen was screwed down until the pressure was great enough to produce a clear, well-inked impression. The screw was then reversed, the paper removed and set aside to dry. No improvements were made to the wooden press until a metal screw was introduced by Danner, a printer of Nuremberg, in the middle of the sixteenth century. Up to the year 1800 all newspapers were printed on such presses.

In 1804 Earl Stanhope made a press entirely of iron, capable of producing very

great pressure by means of a combination of lever and screw motion. This press soon took the place of the wooden presses in the large printing houses, and a battery of them was installed in the offices of *The Times*, considerably increasing the speed of newspaper production.

The next step onward was made by Friedrich Koenig, a German, who invented a steam-driven press in which a revolving cylinder was used instead of a flat plate to press the paper against the forme. In 1814 *The Times* had installed two of these power-driven presses, which were actually the first practical printing machines

as sheet-fed or web presses, according to whether the paper is fed by sheet or reel. Most rotaries are web presses and are fed from rolls of paper sometimes 4 or 5 miles in length.

Platen Presses. These are used to-day principally for printing handbills, programmes, letterheads, and such work known as "job" or general commercial printing. Beginning with the "Cropper," there are many makes of platen press, from the most simple to elaborate styles for fine colour work, embossing and so on. Platens are found in almost every printing plant, and indeed are often the only type of press used



NO. 4 HIGH-SPEED MIEHLE PRESS WITH STREAM FEEDER AND EXTENDED DELAYED DELIVERY

They produced copies at the rate of 1000 an hour as against the 300 an hour of the Stanhope.

Koenig also invented a machine which would print on both sides of the paper at once, known as a "perfecting" machine. In 1848 Augustus Applegarth, a printing engineer, built a machine with a movable cylinder, 17 ft. in circumference, round which were arranged 8 printing cylinders to each one of which the pressmen could feed paper. It had been realized by this time that greater speed could not be obtained by allowing the type matter to keep still. In this new machine both type and paper revolved together on separate cylinders. From this time on the evolution of the printing press made tremendous strides until to-day there are newspaper machines which can produce 32-page papers at 40,000 copies an hour.

Modern Presses. These are of three kinds, the *platen* press, in which a flat surface is used to press the paper against the type, the *cylinder* or *flat-bed*, in which the paper is pressed against the type by means of a steel cylinder; and the *rotary* press, in which the impression is made by a cylinder, but where the type is replaced by a curved stereotyped plate or plates, fitted round a second, or *forme*, cylinder.

Presses are also divided into two classes

in the small shop. They can produce about 1000 impressions an hour, are ordinarily fed by hand and operated either by foot or a small electric motor. The ink is applied to the flat circular plate at the top and carried down to the forme by composition rollers.

Cylinder Presses. These are used for the great majority of book and fine colour work. Large catalogues, magazines and pamphlets are also printed on them, as is most of the high-grade printing of to-day. There are several types of cylinder machines in this country, including two colour models. Another kind of cylinder machine is the two-revolution, so called because the printing cylinder makes two complete revolutions for each impression of the forme, and thus affords continuous revolution, as distinct from the stop-cylinder presses. Two-revolution machines are always sheet-fed, either by hand or by automatic feeder.

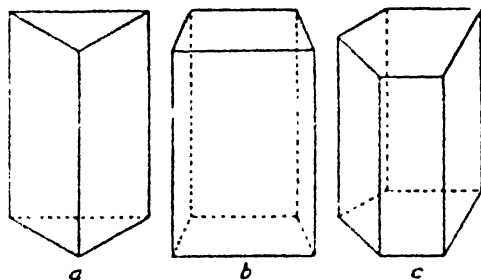
Rotary Presses. The largest and fastest presses built to-day are the rotary presses used for printing periodicals and newspapers, the latter by letterpress methods and the former by letterpress and photogravure. Offset litho also is chiefly produced on rotary presses.

PRIOR, MATTHEW (1664-1721). An English poet and diplomat who took an active

part in eighteenth-century politics—being at one time ambassador in Paris—yet found opportunity to compose several long poems, such as *Alma* and *Solomon*, and a volume of *Tales*, all of which are little read to-day. He shared with Charles Montagu, Earl of Halifax, the credit of writing *The Town Mouse and Country Mouse*, an amusing parody of Dryden's *The Hind and the Panther*, which had some vogue in its time. He is now remembered mainly by his shorter poems—spontaneous lyrics and *vers de société* (like "The Question to Lisetta"), which show an easy and graceful touch—as well as by his poems to children.

PRIORY. A monastic house. See **MONASTICISM**.

PRISM, prizm. A solid which has two equal triangles or polygons for its bases and parallelograms for its lateral surfaces. A



Explanation of the three figures appears in the text.

prism whose lateral faces are perpendicular to the base is a *right prism*, the lateral faces are rectangles. All of the prisms shown in Fig. 1 are right prisms. Other prisms are called *oblique*, then lateral surfaces are parallelograms but not rectangles. Prisms are named from their bases—as *triangular*, *a*; *rectangular*, *b*; *pentagonal*, *c*, etc. The *altitude* of a prism is the perpendicular distance between the bases.

The *lateral surface* is made up of a number of parallelograms, a number equal to the number of the sides of the base. Therefore the *area of the lateral surface is found by multiplying the perimeter of the base by the altitude*.

The *volume of a prism is found by multiplying the area of the base by the altitude*.

PRISON. A place of detention in which offenders against civil and military law are confined. Until about the middle of the sixteenth century, prisons were mainly dungeons or places in which people awaiting trial or execution were detained. Common goals for offenders who had committed small crimes were in existence in various parts of

the country, including the famous Marshalsea and Fleet prisons, used mainly for imprisonment for debt, contempt of court, etc. The London Bridewell was founded in 1552 for juveniles, vagabonds, prostitutes, etc., but there was no general practice of imprisoning serious offenders. The reason was that execution or deportation were the chief methods by which severe punishment was meted out. Prior to 1776 it was the practice to dispatch the worst type of



CELL BLOCK IN YORK PRISON

This old prison, built in the nineteenth century to take the place of one in which Dick Turpin was confined, has now been scrapped in its turn.

Photo. Fox

criminals to America, but when this no longer was possible, the authorities were compelled to consider the improvement and extension of the then existing prison system. John Howard's exposure of the conditions in these prisons compelled Parliament to deal with this matter, and in 1778 a Prison Act was passed, insisting on the provision of separate cells for prisoners as a substitute for the herding and overcrowding which then existed and also the provision of religious and moral instruction. Faced with the practical problem of finding accommodation for the prisoners, however, the Government herded the convicts into the notorious hulks in the Thames and off Portsmouth and Chatham. These hulks were intended to be "temporary" accommodation, but the last was not closed down until 1857.

A further method of disposing convicts was the opening in 1787 of a new penal colony in Australia, and the majority of convicts were sent there, giving Parliament an excuse for its inactivity in the provision of adequate convict accommodation at home. Not until

considerately than are prisoners in civil life. According to a convention of the Peace Conference at The Hague, in 1907, they are simply in the custody of the nation that captures them, and while confined they are to be treated as well as that country's own



WORMWOOD SCRUBS PRISON

Photo: Central

1867 was the practice of sending convicts to Australia brought to an end. In 1842 the "Model" Prison of Pentonville was opened. This and others similarly patterned became known as "public works" prisons, as the prisoners were put on useful work. Prisoners

soldiers. They may be put to work, but must be paid for their labour, and the work must be no more arduous than that performed by the soldiers of the Power holding them. Officers are to receive the same pay that was allowed them by their home



PRINCETOWN PRISON, DARTMOOR

Photo: Topical

lived under greatly improved conditions, each one having a cell to himself. The Prison Act of 1898 placed the control of convict and local prisons under the Prison Commissioners, and since then there has been a steady improvement in prison life.

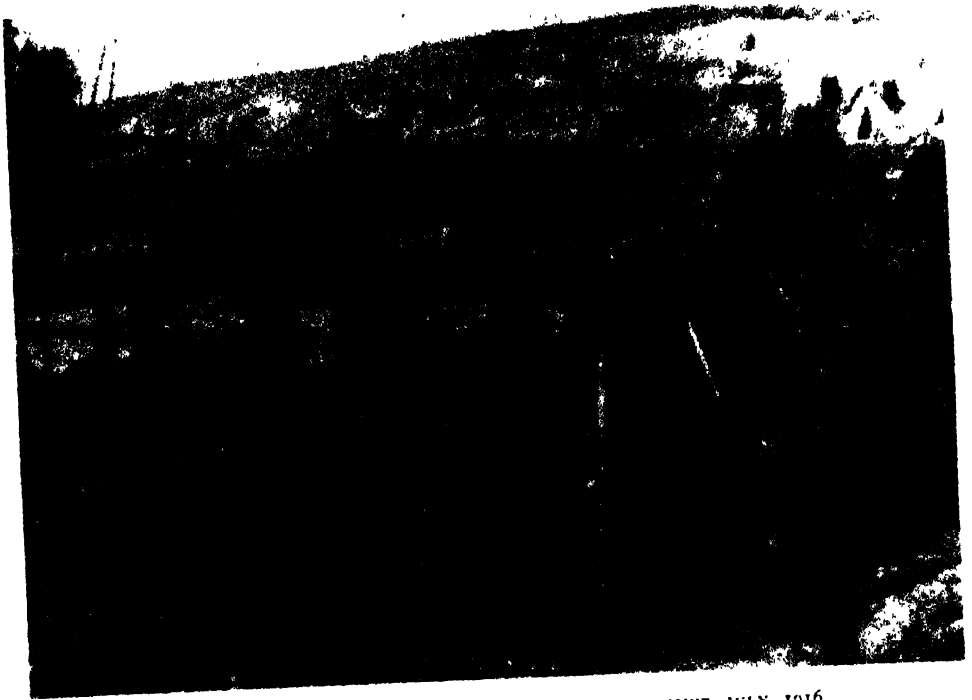
PRISONERS OF WAR. Soldiers or sailors or members of other services who have been captured by the enemy while enlisted under the banner of a country at war. It is not necessary that they be actively engaged in fighting; if they are engaged in any capacity with an army, as guides, sutlers, or electricians, they are liable to capture, though surgeons and chaplains are usually considered exempt from seizure.

In ancient times, prisoners were treated with great cruelty. An Assyrian inscription speaks of the crucifixion of 3000 such unfortunates. At present, among all western nations, prisoners of war are treated more

government. The captors have the right to prevent any prisoner from communicating with anyone whomsoever, and of reading all correspondence sent or received by prisoners. If a prisoner tries to escape, he may be shot or disciplined. If, however, he succeeds in escaping, rejoins his own forces, and is again captured, he cannot be punished for his previous offence.

Conditions in the field, however, are different from those laid down on paper at The Hague.

PRIVATEER, *pri va leer'*. When two nations are at war with each other, the commerce of one is subject to attack by the other. In early times, it was the custom for hostile nations to commission privately owned ships of a neutral nation to assist them in war on the ocean commerce of their enemy. Such commissions were known as *letters of marque*, and ships acting under them



GERMAN PRISONERS CAPTURED IN THE SOMME OFFENSIVE, JULY, 1916
Photo: Imperial War Museum. Copyright reserved



THE FALMOUTH PACKET "HINCHBROOK" BEATING OFF AN AMERICAN PRIVATEER
Photo: G.P.O.

were regarded as privateers. But this practice was open to great abuse, and was contrary to the developing sense of justice among all peoples. Accordingly, a conference at Paris in 1856, attended by representatives of the leading nations, declared that privateering should be abandoned.

PRIVET. A shrub greatly used for hedging. Most varieties are evergreen, and if uncut, bear white flowers growing in terminal panicles from June to September. The leaves are opposite, narrow, elliptical and smooth. This plant will grow well in almost any soil, even in the smokiest of towns. It is easy to propagate, cuttings rooting quite readily.

Scientific Names. The privet is known as *Ligustrum*. The following are the better-known varieties: the common privet, which will grow to a height of 10 ft., *L. vulgare*, the golden privet, with golden foliage, *L. vulgare aureum*; the oval leaved privet, *L. ovalifolium*.

PRIVILEGE. In law, see under **LIBEL**. For Parliamentary privileges, see **PARLIAMENTARY LAW**.

PRIVY COUNCIL. In Great Britain, the chief council appointed by the sovereign. Originally, its purpose was to advise him on matters of state. Its beginning can be traced to the Council of William the Conqueror. As Parliament increased its power, the importance of the Privy Council decreased. The contest between Parliament, which claimed sole power to legislate, and the Crown, which claimed power to legislate through the Privy Council, was definitely settled by the Bill of Rights in 1689.

The Cabinet of Great Britain is a development of the Privy Council, that is, the former began as a select few of the larger council. The Privy Council, besides the Cabinet, is composed of a large number of eminent persons, such as retired ambassadors, judges and distinguished scholars, selected from all parts of Great Britain and its dependencies. For many of them it is simply a title of great honour, for a Privy Councillor, as such, receives no salary. The Archbishops of Canterbury and York, the Bishop of London, and the Speaker of the House of Commons are *ex-officio* Privy Councillors. The Lord President of the Council is a member of the Cabinet.

Members of the Council are appointed for life. The full Council seldom meets, except on the death of the sovereign, or when the reigning sovereign announces his or her intention to marry.

Formal meetings of the Council are attended by the few councillors concerned with the orders to be issued. It is a feature of modern legislation to leave the date of operation of many statutes to be fixed by Orders in Council, and to supplement the

powers of the statutes by extensive Orders in Council to be made from time to time. The administrative work has always been done through committees, which are now State departments, each presided over by a Minister responsible to Parliament. For example, the Board of Trade and the Board of Education are, in theory, Committees of the Privy Council. The Judicial Committee of the Privy Council, composed of high judicial officers of the realm, is the final Court of Appeal from the Ecclesiastical Courts and from Indian, Dominion, and Colonial Courts.

A member of the Privy Council prefixes the title Right Honourable to his name and follows the name with the suffix P.C. (Privy Councillor).

See **BRITISH CONSTITUTION**.

PRIVY SEAL. An official seal once used on public documents in Great Britain. It was intermediate in character between the Signet Seal, that is, the seal used as the signature of the sovereign, and the Great Seal, or the seal used on all public acts of State which concern the United Kingdom. The Privy Seal was used to authorize the issue of money from the Exchequer, or to authenticate documents to the Keeper of the Great Seal, thus authorizing him to affix the latter; and it served to authenticate documents of minor importance. Since 1884 its use has been discontinued, but the office of Keeper of the Privy Seal still exists. His official title now is Lord Privy Seal and Leader of the House of Lords. The holder of the title is a Minister of the Cabinet.

PRIZEFIGHTING. See **BOXING**.

PRIZE OF WAR. See **ADMIRALTY LAW**, **INTERNATIONAL LAW**.

PROBATE. The procedure by which the will of a deceased person is *proved*, i.e. established as valid. Also the document by which the right of administering the deceased's estate is granted to his executors. Probate is either in *common form* or in *solemn form*. Probate in common form is obtained by the executors named in the will, taking it to the Principal or District Probate Registry, together with such evidence as may be required to identify the deceased, to verify the amount of his estate, and to show that the will was properly executed by him. A copy of the will, called the *engrossment*, is made, and to this is annexed a document called the *probate*, which declares that administration of the deceased's estate has been granted to the executors. The engrossment and the probate are handed to the executors, and the original will is kept at the Probate Registry. Death duties have to be paid before probate can be granted. Probate in solemn form is an expensive process and is

necessary only when the validity of the will is disputed. It takes the form of an action in the Probate, Divorce and Admiralty Division of the High Court. See WILL.

PROBATION (Latin, *probare*, to prove or test). When a person has been convicted of an offence punishable with imprisonment, the court may, if it thinks fit, having regard to the circumstances, discharge him conditionally on his entering into recognizances to be of good behaviour and appear for sentence if called on within a stated time, which must not exceed three years. A court of summary jurisdiction, when it is proved that an offence has been committed, may make such an order without actually recording a conviction. Other conditions besides that of good behaviour may be imposed. If the offender fulfils the conditions he may thus escape punishment for his offence, but if he breaks any of the conditions he may be brought to court and sentenced. The court may order him during this time to be under the supervision of a particular person; such an order is called a *probation order*, and the offender is said to be *on probation*. Probation officers (paid by the local authorities aided by grants from Parliament) are appointed for every petty sessional division. Court missionaries are often appointed as probation officers. Their duty is to visit the offender or to receive reports about him, to see that he keeps the conditions imposed, and to report to the court on his behaviour, and also to advise, assist and befriend him and, when necessary, to endeavour to find him suitable employment. The system of probation is extensively used, especially in the case of young persons and first offenders. On the whole it may be said to work well.

PROCEDURE, LEGAL. That branch of law which deals with the forms and methods of approach to a Court of law, and the various ways in which the Court sets about its task of providing legal remedies. Legal procedure is therefore distinguished from *substantive* law, i.e. those branches of the law which deal with the rights and duties of people in their relations with each other, and the general nature of the remedies which the Courts can apply when rights are violated or duties neglected. Rules of procedure are necessarily strict and technical, for time is wasted and expenses multiplied if a case comes before the Court in a chaotic or an unfamiliar form.

High Court Action. An action in the High Court is usually begun by issuing a *Writ of Summons*, to which the defendant is required to *enter an appearance*, either in person or by his solicitor. The Writ has indorsed upon it a general statement of the relief which the plaintiff claims. The next

step in the action is the delivery of *pleadings*. Pleadings are documents delivered by each party to the other, setting out their respective contentions and admissions. The object of them is to narrow down the issue before the case comes into Court, so that each party may know exactly what he has to prove in order to succeed, and need not bring witnesses to prove things which his opponent is prepared to admit. Pleadings ordinarily consist of (a) a *statement of claim*, delivered by the plaintiff to the defendant, setting out in precise and full detail the facts on which the plaintiff relies and the relief which he seeks from the Court; (b) a *defence*, delivered by the defendant to the plaintiff, stating exactly how much of the statement of claim he admits and how much he denies; to this may be annexed (c) a *counterclaim*, where the disputed transaction gives rise to claims on both sides; (d) a *reply and defence to counterclaim* by the plaintiff. Where there is no counterclaim, the pleadings usually stop with the defence; but there may be a *reply* even where there is no counterclaim. Further pleadings are very unusual, they are called (e) *rejoinder*, (f) *rebuttal*, and (g) *surrebuttal*. Pleadings are usually drawn up by counsel, and a party is not allowed to allege at the trial anything which he has not alleged in his pleadings. Where a party in his pleadings fails to give precise details of the facts which he alleges, the other party can demand *further and better particulars*. Another way of narrowing the issue still further after the close of pleadings is by means of *interrogatories* (which see). Where there is any dispute over the giving of particulars or the answering of interrogatories, the parties appear before one of the Masters of the Supreme Court, who decides the matter, from his decision there may be an appeal to the Court. Proceedings of this kind, over disputes arising in the preliminary stages of an action, are called *interlocutory*. When all the preliminary work is finished, the action is set down for trial, and in due course the trial is held. At the trial counsel for the plaintiff usually begins and "opens the pleadings," i.e. reads them to the judge and explains the general nature of the action. The course of the action after that varies greatly, according to whether both sides call witnesses, or one side only, or neither, and on other factors also. When both parties have said their say, the judge sums up the evidence for the jury, and the jury consider and deliver their verdict, or if there is no jury, the judge delivers his judgment or reserves it to be delivered after consideration.

The programme outlined above is that of an action begun by Writ, which is the appropriate procedure where the essence of the action is to redress a wrong. But the Court does much besides redressing wrongs; often it can prevent them by its power of interfering in the conduct of companies, of administering the estates of bankrupts and lunatics, of interpreting documents for the guidance of those who have to act under them, and by numerous other powers. In these cases the jurisdiction of the Court is usually invoked in various ways different from that described above, viz. by *originating summons*, by *petition*, and by *motion*, for a description of which there is no space here.

County Court Action. Proceedings in the County Court are usually briefer than those in the High Court. They are begun by entering a *plaint* at the offices of the Registrar of the Court. A *summons* is then issued to the defendant, setting out the *plaint* in general terms; if the action is for more than £2, more detailed *particulars of claim* are annexed to the summons. In many cases no written answer is required from the defendant and the action proceeds directly to trial; in other cases the defendant is required to reply to the summons with a *notice of defence*, stating the grounds on which he contests the plaintiff's claim.

For the procedure in criminal cases, see **CRIME** (Criminal Law); **BAIL**; **INDICTMENT**; **JURY**.

See also **EVIDENCE**, **JUDGMENT**, **WRIT**.

PROCESS WORK. See **HALFTONE**; **LITHOGRAPHY**, **PHOTO-GRAYURE**, **PRINTING**.

PROCLAMATION. **ROYAL.** An announcement made by the King to his subjects, sealed with his Great Seal, and published in the London, Edinburgh and Belfast *Gazettes*. Besides the ceremony of announcing a new king's accession to the throne, proclamations are used for such purposes as summoning and dissolving Parliament, declaring war or peace, promulgating blockades or embargoes on shipping, etc. It was by Royal Proclamation in 1917 that King George V changed the surname of the royal family from Guelph to Windsor and renounced all his German titles. In former times, laws were made by Royal Proclamation as well as by Act of Parliament; but in the reign of James I the judges told the King that they would not recognize laws made by Proclamation without the authority of Parliament.

PROCRUSTES. One of the famous robbers whom Theseus, the legendary hero of Attica, slew. The story is to be found in Plutarch. The name Procrustes, literally the Stretcher, is really a nickname, his actual name being Damastes. The nickname derives from the peculiar form of entertainment which this robber provided for travellers who were unfortunate enough to meet with him and to accept his apparently friendly offer of hospitality. Procrustes kept a bed, the traveller was tied to the bed. If too short for it, he was stretched until he fitted, if too long the matter was adjusted by lopping off of some of his limbs. The phrase "Bed of Procrustes" has become proverbial for a dilemma in which either solution is equally bad.

PROCTER, BRIAN WALLER (1787-1874) English poet and dramatist who, as "Barry Cornwall," gained some celebrity with a book of *English Songs* (1832). His daughter Adelaide (1825-1864) published her collected poems, *Legends and Lyrics*, in 1858; nine editions were called for in seven years, and some of the verses show a sincerity and charm which make them still readable.

PROCTOR. A term most frequently applied to the disciplinary officers of some Universities. In the University of Oxford they are two in number and are directly responsible to the Vice-Chancellor. Elected annually, their chief function is to maintain



PROCLAIMING A NEW KING

The Sheriff of Bristol reading King Edward VIII's proclamation from the proclamation car, which dates from the reign of George I.

Photo: Central

order in the streets of the city and enforce discipline on undergraduate members of the University. They have authority to impose fines and other minor corrective measures, and to recommend delinquents for "rustication,"

i.e. suspension from the University. In their disciplinary work they are assisted by "bulldogs" (recruited from the College staffs). They have a number of other duties, including responsibility for the proper conduct of examinations and assessorship to the vice-chancellor. In addition, they have the right to veto proposals in convocation.

In the University of Cambridge the proctors have similar duties, except that of sitting as assessors to the Chancellor. Their authority to enforce disciplinary measures on undergraduates by their own initiative is also strictly limited.

The term Proctor is also applied to certain ecclesiastical officials chosen to represent groups of the clergy in convocation.

For KING'S PROCTOR, see that title.

PROCTOR, RICHARD ANTHONY (1837-1888) An English astronomer. Born in Chelsea and educated at Cambridge, he turned his attention to astronomy and authorship.

His most important contributions to science were his studies regarding the rotation period of Mars and his theory of the solar corona.

PROCURATOR, *prok' u ray tor*. A term used at several periods of Roman history. Its primary meaning is "agent" or "steward." After the fall of the Republic it took on an official significance when it became the title of certain officers representing the Emperor in the provinces. They were drawn for the most part from the ranks of freedmen. Their duties were those concerned with the revenues, collecting taxes and paying dues. In the fourth century and after, the procurator became virtually governor of the province.

The term has persisted as an official title. For instance, the medieval *procurator ammanni* was a paid advocate in the ecclesiastical courts. In modern Scottish law the procurator is a "law-agent" in the inferior courts, whilst the procurator of the Church of Scotland is in effect a permanent officer to advise the General Assembly of the Church in legal matters. The name is also given in religious communities, etc., to the member in charge of the temporal affairs of the monastery.

PROCYON, *pro' sy on*. The brightest star in the Canis Minor. See ASTRONOMY.

PROFIT. In economics, the return received by the business man as a reward for the effective combination of land, capital and labour. To illustrate, a business man decides to engage in the manufacture of shoes. He rents a piece of land, and pays rent to the owner. He borrows capital in order to pay for the cost of constructing the plant, installing the machinery, etc., and he pays

interest to the lender. He employs labourers to make the shoes, and he pays them wages. If the enterprise proves successful, the manufacturer, from the proceeds of the sale of shoes, will be able to meet the rent, interest, wages, the cost of supplies, and all other expenses of manufacture, and have left a surplus besides. This surplus is called profit. If, by any chance, he employs in the business any of his own funds, he should deduct interest on them before reckoning his profits.

There are two leading theories as to the nature of profits. One view is that profits are best regarded as simply a form of wages. Another view is that profits are essentially a reward for risk undertaken. In this view, the profits of the manufacturer would be reckoned as the surplus of receipts over expenses, including in expenses not only all the items enumerated above, but also "wages of management," this term referring to such remuneration as the manufacturer could have obtained had he been working for someone else.

PROFITEERING. The term used to denote disapproval of the practice of making large profits out of a nation's distress, such as in time of war. Throughout history, governments have had to intervene to prevent such profit-making; there are records of attempts by the Roman Senate to secure control of the war gains of Roman generals. During the World War, profiteering in Great Britain was not rife, owing to the stringent control and taxation employed by the Government, but immediately the control was slackened soon after cessation of hostilities, and while there was still a shortage of commodities, profiteering became so prevalent that the Government was compelled by public opinion to introduce legislation. To check excessive profits, the Government in 1916 passed the Profiteering Act, which enabled the Board of Trade to make investigations into all complaints concerning high profits. The Act remained in force until May, 1921. By this time the immediate shortage of food was at an end and prices, instead of rising, were falling. Since that period the Government has introduced several measures to prevent exorbitant rent charges. The Federal Trade Commission of the United States collected information during the war, showing that profiteering was extensive in that country, and there is also evidence that there was profiteering by the German steel and mining companies.

PROFIT-SHARING. A system by which employees are given a share in the profits of a firm, in addition to their regular wage. The idea is entirely corporate, and is

intended to interest the workers in the business as a whole.

The first notable experiment in profit-sharing was made in 1842, in Paris, by a house painter named Le Claire, who found that the policy had the effect of increasing the remuneration of both employee and employer through the better quality and greater amount of work accomplished. The method has since been widely adopted in England, France and America.

The advocates of profit-sharing claim that it ensures justice for both capital and labour, each receiving more under the efficiency which the system encourages, and that it lessens industrial unrest by harmonizing the interests of both classes. Some labour leaders profess to see in it, however, only a substitute for real reform. They contend that it stimulates the labourers to greater production, and then gives them only a portion of the increased production.

Many profit-sharing schemes break down when there are no profits, as it is very difficult for a trader to explain this to his workpeople; and also such a statement may injure his credit and be even dangerous.

PROHIBITION. Usually, the condemnation under penalty of the sale of intoxicating liquor. Such prohibition has been repeatedly advocated by members of temperance organizations on religious and social grounds



PROHIBITION IN AMERICA
Pouring away "bootleg" whisky.
Photo: Topical

From 1922 to 1933 prohibition was the law of the United States, and in that country it was given its most extensive and prolonged trial. Many of the American States in the last century restricted the sale of intoxicating liquors, and by 1906 thirty states had adopted local option laws and drinking saloons had been made illegal in more than half the territory of the United States. During the World War the sale of intoxicating liquor was prohibited as a temporary

measure, but in addition Congress passed a prohibitory amendment, known as the Eighteenth Amendment, to the Constitution of the United States. This amendment, which was ultimately ratified by the States, prohibited throughout the country the manufacture, sale, transport, importation, or exportation of intoxicating liquors. The Eighteenth Amendment became effective on 17th January, 1920. The National Prohibition Act, popularly known as the Volstead Act, was later passed to enforce prohibition, and it provided severe penalties for the transgressors of the Eighteenth Amendment; however, there were established in all parts of America illicit distilleries and breweries and elaborate distributive organizations, the owners and staffs of which indulged in every form of bribery, corruption and smuggling. Vendettas between rival gangs, who committed murder and arson without hesitation, were common. These gangs became so strong that they could not be stamped out by the police, for in many cases they had bought the support of politicians, and there were many people in the United States who believed that prohibition had led to more and worse evils than it had stamped out. By the end of 1933 the experiment was abandoned. Finland, Norway, Turkey, Russia and other countries that have tried prohibition, have also abandoned it. Prohibition in certain areas, commonly known as Local Option (which see) is found in Scotland.

PROJECTILE. A word applied to bullets and shells fired from firearms. See ARTILLERY, BULLET, ORDNANCE, SHELL, TORPEDO.

PROJECTOR. General term applied to instruments or weapons for throwing light pictures, gas, or flame on to a distant object. There are four distinct types of projector: the *searchlight*, which, by means of magnifying prisms and reflectors, throws a beam of light for many miles, the same principles being utilized in the lantern of a modern lighthouse, the *magic lantern*, or *kine-matograph*, for the display of lantern slides or films; the *gas projector*, consisting of a metal tube fixed in the ground at a sharp angle, from which an explosive charge hurled a gas-filled projectile for distances of over a mile, the *flammenwerfer*, or flame-thrower, a weapon invented by the Germans and used by both sides in the World War to spray liquid flame on enemy troops.

PROLETARIAT, *pro le tair' iat* A general term for the wage-earning classes, not possessed of property. A form of the word was used in ancient Rome with a similar meaning. See BOLSHEVISTS.

PROMETHEUS, *pro me' thus*. A character in Greek mythology, a son of the Titan

Iapetus, and the brother of Epimetheus and Atlas. To Prometheus and Epimetheus was entrusted the task of endowing the animals with the qualities and powers which they needed, and while Epimetheus was engaged in this work, Prometheus occupied himself with creating man from clay.

To prevent his being left helpless at the mercy of the lower animals, Prometheus



PROMETHEUS TORTURED BY THE VULTURE

Photo. Mansell

determined to bestow upon man the gift of fire, which would help him to subdue all things. This fire he stole from the gods, who alone possessed it. Zeus was so enraged at this theft that he had Prometheus chained to Mount Caucasus, where every day an eagle came and fed upon

his liver, which at night grew again, until Heracles took pity upon him, killing the vulture with an arrow (see *SAGITTARIUS*), and breaking his chains.

The story of Prometheus has been a favourite with poets of all times. Aeschylus left a *Prometheus Bound*, and Shelley wrote a *Prometheus Unbound*.

PROMISSORY NOTE. A promissory note (P.N.) is a bill of exchange (which see), with the difference that it is an unconditional *promise* in writing, instead of an *order*. It promises to pay a sum of money, whereas a bill of exchange is an order to pay. In most respects it is like a bill of exchange, and the Bills of Exchange Act, 1882, applies with the necessary modifications. A promissory note is transferable in the same manner as a bill of exchange, and may be similarly endorsed. Unlike a bill of exchange, it does not, of course, require acceptance, as the debtor accepts liability by drawing and signing it. All promissory notes require an *ad valorem* stamp, which must be impressed in the case of inland notes. The duty ranges from 2d. on a promissory note of not exceeding £10 to 1s. for every £100 or part, if exceeding £100. A promissory note is familiarly called a "note of hand."

See *NEGOTIABLE INSTRUMENTS*.

PRONG-HORN. An animal sometimes called the American antelope, though not a true antelope; it forms a separate family



YOUNG PRONG-HORN ANTELOPES

Photo. Canadian Official News Bureau

having some kinship to the American white goat. The name refers to the great black horns of the mature male, which rise a foot directly above the eyes, and have one prong (sometimes more) on the inner side.

Scientific Name. *Antilocapra americana*.

PRONOUN. The part of speech which is used in place of a noun to avoid wearisome repetition (Latin *pro nomine*, for a noun).

In other words, a pronoun is a word that mentions a thing without naming it, and the word to which it refers, whether expressed or understood, is known as its *antecedent*. With this antecedent it agrees in person, number, and gender. Its case depends upon its office in the sentence, and is regulated as the case of the noun.

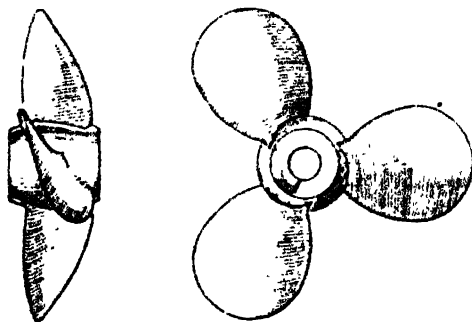
Classes of Pronouns. Pronouns are so different in type that they are classified for ease in studying. One of the simplest divisions is that into *personal*, *interrogative*, *relative*, *demonstrative*, *indefinite* and *numeral* pronouns.

(a) A word that in itself shows whether it represents the speaker, the person addressed, or the person or thing spoken of, is called a *personal* pronoun, e.g. *I, you, they*. In their genitive forms these are called *possessive* pronouns (*mine, ours*, etc.). By the addition of *-self*, personal pronouns are converted into either *emphasizing* pronouns (He *himself* said it) or *reflexive* pronouns, used in the object or after a preposition to refer to the subject (He hurt *himself*). (b) The pronouns *who, which, and what*, when used to ask a question, are called *interrogative* pronouns. (c) A *relative* pronoun is one that not only "relates" to an antecedent in a

preceding clause, but serves as a conjunction connecting its own clause with the clause containing the antecedent. The relative pronouns are *who*, *which*, *that*, and *what*. (d) Pronouns which point out some particular person or thing, answering the question, *Which?* are called *demonstrative pronouns*. This class includes *this* and its plural *these*, which indicate persons and objects close at hand; *that* and its plural *those*, indicating persons and objects that are more distant. (e) The name of *indefinite pronouns* is given to another class of words which do not refer to a definite person or thing. In this group are included terms like *one*, *each*, *other*, *any*, *some*, *either*, *neither*, *both*, *many*, *sundry*, *several*, and *certain*, together with their compounds, such as *anyone*, *anybody*, *each one*, *someone*, *somebody*, *no one*, *everyone*, *either one*, *anybody else*, *nobody else*, and the like. (f) *Numeral pronouns* may be either *cardinals* (Give me *two*) or *ordinals* (*The second* is better than *the first*)

PROPELLER, OR SCREW. A mechanical device used to drive aircraft and ships, and for a variety of other purposes. The aeroplane and marine propellers are the best-known types, but other forms are employed in the windmill, the electric fan, etc.

The use of a screw propeller for ships is



SHIP'S PROPELLER

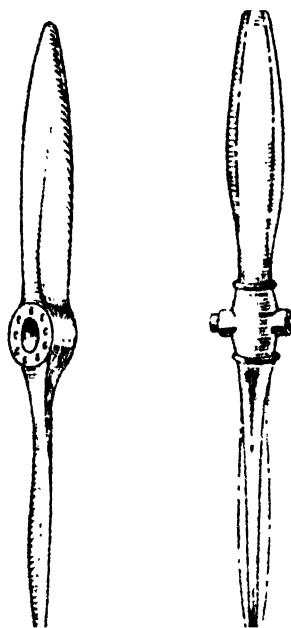
very old, having originated with John Fitch in 1796. His screw was in the form of a spiral around a cylindrical rod. By experimentation it was found that better results were obtained by using only portions of the spiral in the form of blades. The shape of the blades, as well as their diameter and pitch (slant), was determined both by theory and by experiment. In general, the present-day blade is elliptical in outline, and the number of blades is usually three, though two and four-blade propellers are also used.

A certain loss of motion, called *slip*, is experienced with both marine and air propellers. It is the difference between the vessel's actual speed and the speed which it would have if the propeller were acting upon a solid.

The factors that determine the speed of a given ship are engine speed and horse power, and the pitch and diameter of the propeller. It is the purpose of good design to keep the slip as low as possible. Even under the best conditions, it will be from 20 to 30 per cent.

Marine propellers are made sufficiently large to have adequate driving power at the steady speed at which slip or "cavitation" is lowest. They range from 10 in. diameter for small boats, to the giant propellers of the *Queen Mary*, weighing 35 tons each.

The aeroplane propeller is known as an *airscrew*. Its function is to change the power of the engine into a thrust which will give



AIRSCREW

Fixed (left) and variable pitch.

velocity to the plane or airship. It consists of two or more blades, each of which is shaped, in section, like an aeroplane wing. In effect, the action of the propeller is like spinning a small wing about one of its ends. The same laws that govern the operation of the wings apply also to the action of the air-screw.

Air-screws are of two types, the pusher air-screw and the tractor air-screw. The former is placed behind the main planes or body of the aircraft and pushes the machine forward by its action, while the latter is placed in front and pulls it forward.

In some aircraft, both types are used in tandem. The *variable pitch air-screw* is coming into increasing use. In this type the

angle of the blades can be altered so as to increase or decrease the thrust of the screw, the action corresponding in a general way to that of the gearing of a motor-car.

Air screws are made of laminated strips of wood glued together and shaped, metal, or a composition with bakelite as the chief constituent (see **BAKELITE**). Each material has its advantages, but metal forms are coming more and more into use, though wood treated under great pressure with an enamel solution is returning to favour. Duralumin is the preferred metal for this purpose. Because of the very high speed of the blade tips, it is necessary that the material used should be able to withstand extremely high stresses. Propeller speed usually varies between 1600 and 1800 revolutions per minute.

The Autogiro. This is an aeroplane in which the propeller is supplemented by four large blades which rotate horizontally above the body of the plane, and the wings are dispensed with. The blades are not driven by an engine, but by the action of the wind, just as in the case of the windmill. See **AUTOGIRO**.

The Windmill. The function of the air-screw used in the windmill is the opposite of that of the ordinary propeller. Instead of converting power into a moving thrust, the windmill receives power from a windstream and changes it into a rotating effect. The theories and laws of the air-screw, however, apply also to the windmill.

PROPERTIUS, *prop'ertius*, SEXTUS. A Roman elegiac poet, born between 54 B.C. and 43 B.C. The facts of the life of Propertius are hardly known. All that can be stated with certainty is derived from the four books of Elegies which he has left us. These deal mainly with the course of a love affair with a lady whom the poet calls Cynthia. Her real name was Hostia, and she was a courtesan, a fact which made it a legal impossibility at that date for Propertius as a Roman citizen to marry her. The affair apparently came to an end through indifference on the part of Propertius, who in the fourth book does not mention Cynthia, beyond recording her death in retirement and neglect. That his love while it lasted was deeply sincere may be inferred from the fact that the passionate fire of the first three books is not sustained in the fourth. A wholly delightful lyric poet, Propertius is freer in his metrical style than either Ovid or Tibullus, and yet possibly more inventive of phrase and redolent of charm than either. His influence can clearly be traced in the seventeenth-century lyric poets in England. The date of the death of Propertius is also unknown, though a reference in Ovid places it before A.D. 2.

PROPERTY, LAW OF. The law of England differs from that of most other countries in that, instead of being founded on a comprehensive code enacted by legislation in modern times, it is the product of the steady growth of centuries. Nowhere is this more apparent than in the law of property, which, though adapted to the needs of the present day, still keeps the language of feudalism.

In feudal times the primary, almost the only, source of livelihood and form of wealth was *land*. Men lived on the land, worked on it, and looked to it for their sustenance and that of their families and descendants. Next to land came things owned in connection with the land, cattle and sheep, ploughs and other farming gear, and the furniture of a man's home. All of these were called *chattels* (cattle). Lawyers called land *real property* and chattels *personal property*. The reason of this was that if A wrongfully took B's sheep and killed and ate it, the sheep was gone, and if B took the dispute to the Court, it was not to get his sheep back but to obtain redress for the *personal* wrong which A had done him. But if the quarrel was over the ownership of a piece of land, the substance of the dispute was the *thing*, the land, the problem for the Court was, what is to be done with this thing, this piece of land? Land was therefore called "*real*" property, from the Latin *res* (a thing). In feudal times there was no such thing as a lease; and so when leases came into being, the lawyers did not know whether to class them as real or as personal property, as land or as chattels, seeing that a lessee is not the owner of the land. Finally, they decided to call them *chattels real*, and to class them as personal property; and so they remain to this day.

The third thing which a man needed in the turbulent times of which we are speaking was protection from violence. It was to this that the feudal system owed its origin, a system under which every man who had land held it as tenant of some lord, who in return for certain services afforded him protection. The feudal conception of lord and tenant is not to be confused with the modern conception of landlord and tenant, the latter is purely a matter of contract, but the former arose out of the structure of society. Thus, under the feudal system, no one was the absolute owner of land but the King; everyone else was either a tenant of the King or a tenant of a tenant of the King, and so on down the scale. Various kinds of tenure were distinguished according to the services which the tenant had to perform for his lord. Thus a knight had to perform military duties and was said

to hold his land in *knight service*. Great officers of State had to perform duties about the royal Court, and held their land in *grand serjeanty* ("serjeant" means "servant"); lesser Court officials held land in *petty serjeanty*. Priests and monasteries were granted land in *frankalmoin*, i.e. on condition of performing spiritual offices. But by far the most common form of tenure was *free and common socage*, the only form of free tenure which has survived, and is now known simply as *freehold*. The services consisted at first chiefly of doing certain work on the lord's demesne land (see *MANOR*); later they were either allowed to lapse entirely or were commuted for money payments, most of which also lapsed as the value of the currency changed. The result is that a freeholder may now be regarded for all practical purposes as the absolute owner of his land, although in theory he is still only a tenant. The lowest form of tenure was *villein tenure*, later known as *copyhold*.

As time went on, these medieval distinctions of tenure lost their importance, and by 1660, when tenure in knight service was formally abolished, all land had come to be regarded as either freehold or copyhold.

Meanwhile another class of distinctions was growing up. Where *A* granted land to *B* (whether on sale, or by way of gift, or by will) he might grant it either outright "to *B* and his heirs for ever" or he might grant it for a limited interest only, e.g. "to *B* for life," so that on *B*'s death the land would come back to *A* or *A*'s heirs. Another kind of grant often made was "to *B* and the heirs of his body"; the result of this was to give the land to *B* and to his direct descendants, but if *B*'s line of descent ever died out the land reverted to *A* and *A*'s heirs. The degree of ownership conferred by a grant of land was called in law an *estate* in the land. Thus a grant of land for life only was said to confer a *life estate*, a grant to *B* and the heirs of his body an *estate tail* or *in tail*, and a grant to *B* and his heirs for ever an *estate in fee simple*. Besides being able to grant land to *B* for life, leaving it to revert to himself on *B*'s death, *A* could equally well grant it to *B* for life, with *remainder* (i.e. and then) to *C* in fee simple, or to *B* for life, with remainder to *C* for life, with remainder to *D* in tail, with remainder to *E* in fee simple, thus piling up a succession of estates in respect of the same piece of land. In these cases *C*, *D* and *E* are called *remaindermen*, and their estates are said to be *in remainder* or *reversionary*, while *B*'s estate is said to be *in possession*, because he gets it at once. This piling up of successive interests in property

is frequently found in wills and marriage settlements, where it is desired to tie up the property and keep it in the family as long as possible (see *SETTLEMENT*). The whole of this branch of the law was revised in 1925 and in many ways modified by a series of Acts of Parliament; but most of the old expressions, such as "fee simple" "remainder," etc., have been preserved; estates tail are now called "entailed interests."

With regard to personal property, this was never subject to the feudal conceptions of ownership. A man could not do what he liked with his land, but he could do what he liked with his ox or his plough. There were therefore no different kinds of tenure or "estates" in chattels; a man could own these absolutely. In more recent times land has lost its pride of place as the principal form of wealth; and all the new, intangible kinds of property, bank balances, investments and securities of innumerable varieties, are classed as personal property. As a result, the distinction between real and personal property had by 1925 come to be regarded as something of more historical than practical value. The legislation of 1925, while retaining the nominal distinction, has abolished most of the legal differences between them. Thus, before 1925, if a man died intestate, his real property descended according to one set of rules and his personal property according to another. This anomaly has now been removed.

PROPONTIS. The ancient name of the Sea of Marmora. See *MARMORA*.

PROPORTION. In mathematics, an equality of ratios. *Ratio* is the relation of one quantity to another and is found by division (see *RATIO*). The ratio of one quantity to another of the same kind is defined as the number by which the second must be multiplied to produce the first. It may be expressed as a common fraction, as $\frac{2}{6}$ or $\frac{a}{b}$

or in the form of 2 : 6. *a*, *b*. The quantities compared are called the *terms* of the ratio. The first term is the *antecedent*, and the second the *consequent*. In the ratio *a* : *b*, *a* is the antecedent and *b* the consequent. If both terms of the ratio are multiplied or divided by the same number, the value of the ratio is not changed. The ratio 2 : 4 is the same as 4 : 8; also, $\frac{2}{4} = \frac{1}{2}$.

A *proportion* is an expression of equality of ratios, as 2 : 4 :: 3 : 6; *a* : *b* :: *c* : *d*. Proportions may also be expressed in common

fractions, as $\frac{4}{2} = \frac{6}{3}$ or $\frac{a}{b} = \frac{c}{d}$. The quantities

compared in the two ratios constitute the *terms* of the proportion. The first and last

terms are the *extremes*, the second and third the *means*. The general law of a proportion is: *The product of the extremes is equal to the product of the means.*

PROPORTIONAL REPRESENTATION. A device for securing that in an election by ballot, where there is more than one place to be filled, there shall be a fair representation of the different parties contained in the electorate. The most common system adopted is the Single Transferable vote. According to the number of candidates to be elected, it is determined how many votes will secure a majority. A candidate attaining the minimum is elected, any excess votes for him being transferred to the candidate for whom the elector has indicated his second choice on the ballot paper. When the second candidate has obtained the quota the superfluous votes are then transferred to the electors' third choice, and so on until all the places are filled. When no candidate obtains the required minimum those at the bottom of the poll are eliminated and the votes transferred to the next choice.

Although the efforts of the Proportional Representation Society have not yet succeeded in putting this form of minority representation into general use in Britain, the system is adopted by University constituencies electing more than one Member of Parliament, and by the National Assembly of the Church of England. This or some other form of proportional representation is used also outside Great Britain, particularly in the parliamentary and local government elections in the Irish Free State. On the continent of Europe also it is making great headway, and it has spread as far east as India and Japan. Iceland, with the oldest parliament in history, has adopted it.

A modification of the Transferable Vote system is to be found in the Alternative Vote. If no candidate obtains an absolute majority over the other candidates at the first election for one seat, only the first two candidates stand again for a second election, the second preference of the voters for the excluded candidates being transferred to those who are remaining. See also ELECTIONS; SECOND BALLOT.

PROPRÆTOR, *pro præ' tor*. In ancient Rome, governor of a province.

PROPYLÆA, *pro pil' læ*. See ATHENS.

PROSECUTION. See CRIME (Criminal Procedure).

PROSERPINE, *pros' er pin*. The Latin form of the name of the Greek goddess Persephone, the daughter of Demeter, goddess of agriculture. Herself the special divinity of flowers, Persephone spent much time in the meadows tending those she loved. One day the god Pluto came by in his chariot, drawn

by his coal-black horses. Seeing the maid thus unprotected, Pluto seized her and bore her off down to his underground home. Later she was permitted to spend half the year with her husband in Hades, and half the year on earth. During each six months that she was permitted to be above ground, vegetation flourished, but during the rest of the year winter reigned. This is one of the old myths which account for the change in seasons.

PROSPECTING.

Searching for minerals. Formerly the prospector operated mainly by chance and individual prospectors suffered intense hardship in the hope that they would find rich ore and become wealthy.

To-day, while there are still many individual prospectors in the remote parts of the world, scientific knowledge has made the task easier and surer. Scientists are now well acquainted with the normal distribution of the physical characteristics of the globe. Methods used by scientists for locating minerals are, (i) magnetic, (ii) electrical, (iii) gravitational, (iv) seismic, (v) radioactive, (vi) geothermal. Electrical methods include, (a) spontaneous polarization, (b) equipotential, (c) resistivity, (d) electro-magnetic.

PROSTHESIS. See DENTISTRY.

PROTECTION. An interference by the State, for the benefit of a particular section of the community, with the natural growth of commerce and industry. The Protection may be afforded by the payment of a bounty to the home producer, or by the imposing of a duty upon foreign products, or by a regulation or quota system of imports. Such interference may certainly be justified on political grounds. From the purely economic point of view, the removal of every possible hindrance to co-operation among nations—which is another name for international division of labour—seems desirable.

But just as the interest of an individual may be counter to the interest of the community, the interest of a single nation may be counter to the interest of mankind at large. If "economic nationalism,"



PROSERPINE.
Photo Mansell

that is, the strictest limitation of imports, became general, Britain would fare badly; for the prosperity of Britain has been attained by her export trade.

Free Trade is a policy of interdependence, a policy particularly applicable to a country relying upon others for supplies and markets. Protection is a policy aiming at self-sufficiency, a policy particularly applicable to a country of widely diversified resources. Free Trade is a policy that contemplates continuous peace. Protection is a policy that has in view the possibility of war.

The economic arguments advanced for Protection are put thus. Handicap the foreign competitor by the imposition of substantial duty: we shall then have an assured home market. Having this, our producers will be able to work at full capacity; employment will increase and costs will fall.

Moreover, Protection acts as an indirect subvention and encouragement to industrial experiments. An infant home industry could, under peace conditions, hardly expect to compete successfully with a long-established foreign competitor. To overcome buyers' reluctance to change would itself, quite apart from the initial costs of establishing the business, entail almost prohibitive outlay. Yet, when the early difficulties had been successfully surmounted, the home industry might be able to produce at lower costs than its foreign competitors. Such Protection, in as far as it brought about a more effective use of the world's resources, would benefit mankind. From this aspect, Free Trade might be charged with tending to make international trade unprogressive under it innovations and experiments are stifled through full grown foreign competition. This argument specially applies to territories largely undeveloped.

PROTECTIVE COLORATION. Widely but less correctly known as *MIMICRY*, an important factor in the life of animals and plants, ensuring protection in the struggle for existence. Fish are darkly coloured on top and light underneath, as a protection against enemies above or beneath them; some are coloured like the weeds among which they live. Frogs and snakes which live in green foliage are coloured a similar green. Birds, reptiles, and animals of the desert are mottled grey, or are sand-coloured. Some hares, rabbits, weasels, and other animals which live in cold climates change their earth-coloured coats to coverings of white when snow and ice are on the ground. A well-known example is the interchange of colours in the skin of the chameleon.

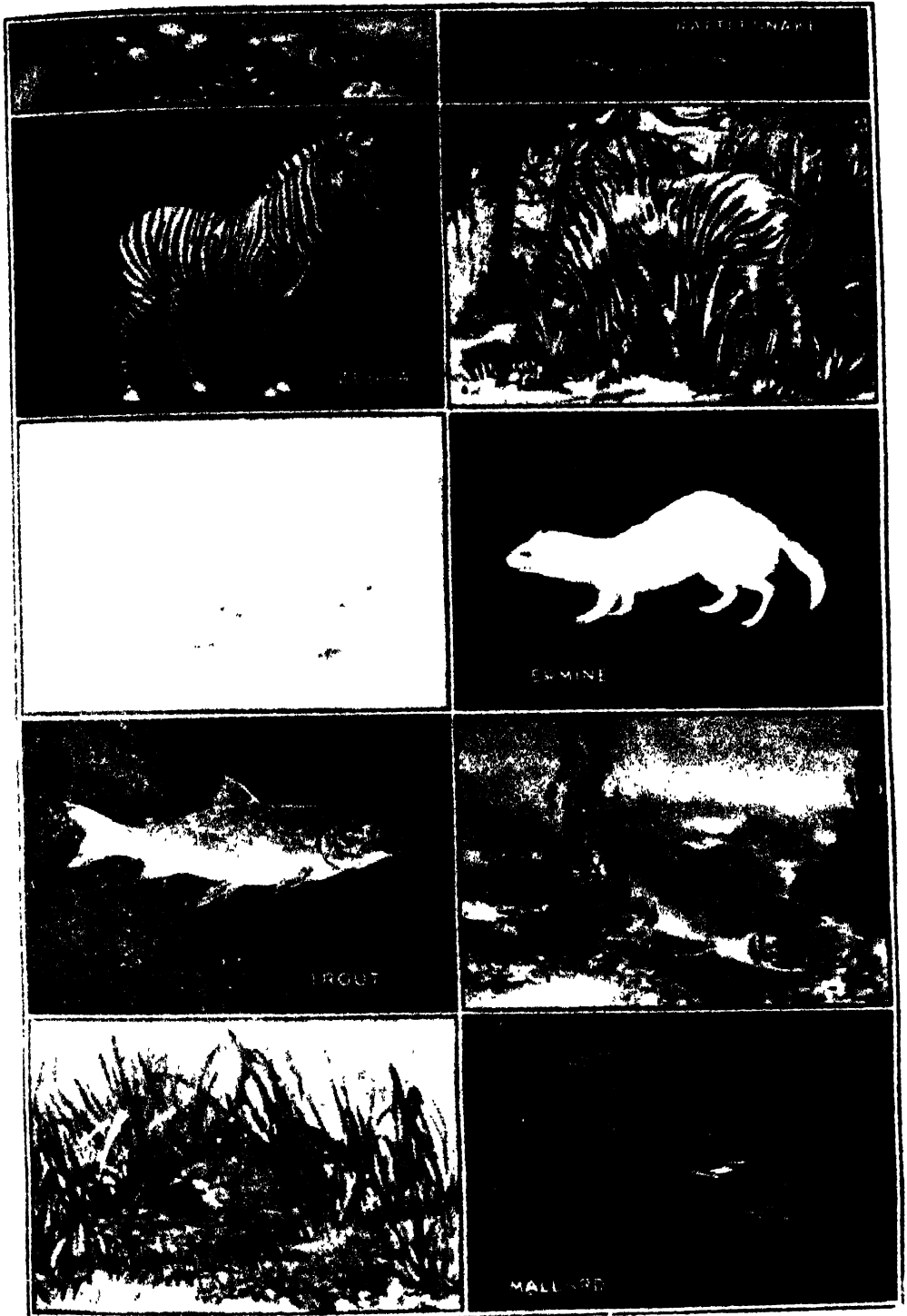
Most striking protective resemblances are seen, however, in structure as well as colour, especially among the moths, butterflies, and

other insects. The *kallima*, or dead-leaf butterfly of India, settling on a twig and folding its wings, is indistinguishable from a dried leaf. Many butterflies, when in flight, are like falling leaves. The stick insect looks so much like a twig it is almost impossible for an observer to discover it even when looking directly at it. Some insects resembling other objects in nature lure to themselves the prey they require as food. For instance, an Indian insect called the *praying horse* looks like an orchid, and smaller insects, attracted to it, are caught. Some fly-catching birds of Brazil have flower-like crests which attract their prey. This form of colour resemblance also appears among carnivorous or insect-eating plants.

Another strange form of protective coloration—the form which suggested the term *mimicry*, although it does not appear through any act of the insect—is illustrated by the viceroy butterfly. It is an edible butterfly not distasteful to birds, but though not nearly related to the monarch butterfly, which birds will not eat, it resembles the monarch so closely that it is protected from its bird enemies. Numerous defenceless moths and flies are coloured so much like stinging bees and wasps that their enemies avoid them.

Although many theories have been advanced to explain these facts, the generally accepted belief is that they are the result of natural selection.

PROTECTORATE. The status of a country, the foreign relations of which are controlled by a stronger power. More frequently than not, the stronger power also exercises a stringent control over the internal affairs of the protectorate. As Professor A. J. Keith the well-known constitutional lawyer, points out, within the British Empire, the distinguishing characteristic of a protectorate is that the Crown assumes and exercises full sovereign power, without, however, annexing the territory, whereas in a "protected" state, the sovereign authority belongs to its own sovereign and not in any sense to the British Crown. In such a protected state, the relationship between the State and the British Crown is regulated by treaty. One of the distinctions between a colony and a protectorate is that a colony is definitely a possession of the Crown, and that all British legislation intended for British possessions extends to it, whereas in the case of protectorates, legislation by the central Parliament is only applicable when the Act in question was intended to apply to the protectorate. Legislative power over protectorates is derived primarily from the Foreign Jurisdiction Act, 1890, which enables the Crown to proceed by Order in Council. The Colonial Office is responsible



to Parliament for the administration of the protectorates. Establishment of a protectorate is not necessarily a prelude to annexation. Egypt, for instance, was created a British protectorate in 1914, but was conceded substantial independence in 1922. British protectorates include Bechuanaland, Swaziland, Nyasaland, Somaliland, Uganda and Zanzibar.

PROTECTOR, THE LORD. In England this title has been borne by those who have ruled for youthful sovereigns, but has not always been applied. It was not used in the childhood of Ethelred "Unrede," whose affairs were apparently managed by his mother. Richard II's youth was dominated by his uncles, not by one Protector. For Henry VI, his uncle of Bedford was Regent in France, his uncle of Gloucester Governor in England. Richard of Gloucester became Lord Protector to Edward V. Henry VIII appointed no Protector for Edward VI, but the Earl of Hertford assumed the title, which was not used by his successor, Northumberland. The title, being vague and not necessarily monarchical, was avoided by Oliver Cromwell. It has not since been employed.

PROTEIDS, *pro' te idz*. A word practically synonymous with *proteins*. The latter term is in more general use.

PROTEINS, *pro' te ins*. A class of food substances whose special work is the building of tissue and the repair of broken-down cells. Secondly, they furnish heat and energy. Proteins are the only organic food compounds that contain nitrogen; in addition, they are made up of carbon, hydrogen and oxygen, and they also contain small amounts of mineral matter. White of egg, the curd of milk, the gluten of wheat, and muscle fibre of meat are typical proteins. While protein foods as a group are indispensable in the human diet, the fifty or more proteins which have been studied and analysed are known to vary considerably in their nutritive value. It has been found that proteins can be resolved into about a score of simple digestion products called *amino-acids*. These substances show great diversity in their power to further the growth and maintenance of tissue. For example, gelatine, a protein animal jelly, is readily digestible and capable of being served in an appetizing manner, but it lacks three amino-acids that are essential for growth. Hence it is low in nutritive value. Milk and wheat are both important protein foods, but neither has the combination of amino-acids that would make it a perfect food for growing creatures. Used together, the two foods provide a much better ration because one supplies what the other lacks.

Proper selection of the kinds and amounts of protein foods is one of the basic problems

in dietetics. While the building of tissue is a vital function of proteins, only a small part of the amino-acid content absorbed from the digestive tract is used for this purpose. The remainder is burned to furnish heat and energy. Whatever protein material is not used is eliminated by the organs of excretion. None is stored for future use. These facts are the basis of the warnings about eating too much protein.

PROTEROZOIC, *pro' ter o zō' ik*, AGE. The second era of geologic time, succeeding the Archaean and succeeded by the Palaeozoic Age. The name, taken from the Greek, means "pertaining to early life." A great series of stratified rocks was formed, which in some districts have a thickness of more than 30,000 ft. Groups of igneous rocks, partly of volcanic origin, are intercalated between some of the sedimentary rocks.

The life of this era has been the subject of much research. The fossils indicate that, early in the era, marine algae were abundant, and that later several classes of invertebrate animals, especially protozoans, sponges, and worms, made their appearance.

PROTESILAUS, *pro' tes il ay' us*. In Greek mythology, one of the chiefs who joined in the expedition against Troy. An oracle had foretold that the first Greek who attempted to land would meet death immediately; and Protesilaus, seeing that the other chiefs hesitated, leapt ashore and was instantly slain.

PROTESTANT. The name generally applicable to all Christian bodies outside the authority of the Roman or the Orthodox Catholic Churches. The term has never been used in an official description of the Church of England, which can in no sense be considered as essentially a "protesting" Church. The law of England has, however, adopted the term in the "Protestant succession" and the coronation oath, and the term is often applied to the Established Church. Protestants number about 200,000,000. The name was first used in 1529, when an edict of the Diet of Spire threatened the German Reformation with extinction. This assembly decreed that the Scriptures should be expounded only on the lines authorized by the Roman Catholic Church, and endeavoured to restore the Mass in states where it had been discontinued. Several princes and fourteen imperial cities made a formal protest against the edict, and from this circumstance became known as *Protestants*. The name soon came to mean all those who followed Luther. Later it became the general term for all members of the Christian Church outside of the Catholic denomination.

The term now is often rather vaguely used. Many describe themselves as Protestants out

of antagonism to the Roman Catholic Church and distrust of its doctrines and practices. Protestantism has one of its deepest roots in its opposition to Papal authority, and what may be called in general sacerdotalism. But, in its modern meaning, it is much more than a mere denial or protest. It has its positive affirmative principles, and, with regard to doctrine in general, the following may be described as Protestant fundamentals—

1. Reliance on the Bible as the sole ground of instruction for the believer, as opposed to the Catholic doctrine that the tradition of the Church and the decisions of Councils and Popes mediate the truth.

2. Direct communion with God alone in prayer, implying the rejection of any kind of mediation in this of the Virgin Mary or of the Saints through invocation.

3. That the Grace of Christ for salvation is given directly to the believer through faith, and not through the Sacramental system of the Catholic Church.

4. The general priesthood of believers, as against the Catholic view of a sacerdotal order of Ministers depending upon the Apostolic Succession, and having peculiar spiritual powers and functions.

5. An individualistic point of view regarding the relation between the believer and God, admitting largely the right of free private judgment, and stressing the subjective side of religion, as opposed to the Catholic adoption of symbolism and ceremonialism.

The above makes up a very condensed summary of Protestant principles. These may be said to be common to the large number of Protestant Churches, which, however much they differ in details of doctrine, of church polity, and devotional practices, are united in these fundamentals. Protestant bodies also agree in a general adherence to the principles of the Reformation, and in such essential doctrines of Christianity as the Incarnation and the Atonement of Christ.

PROTEUS, *pro' te us*, or *pro' tus*. In Greek mythology, one of the lesser gods of the sea, who possessed the gift of prophecy and had, in common with all the gods, the power of changing to any shape in which he wished to appear. Any one who could catch hold of him could compel him to foretell the future. When asked to prophesy, he invariably refused, and to evade capture, changed rapidly through a bewildering variety of forms.

PROTOCOL. A word derived from the Greek, signifying originally the first leaf glued on to a manuscript to indicate authorship and contents. Afterwards it came to mean the original draft of a diplomatic minute of proceedings of an international

conference, signed by the representatives of the participating states and serving as a basis for subsequent negotiations. A protocol may, when ratified, have the validity of a formal treaty. In particular the Geneva Protocol of 1924 was a draft treaty dealing with international arbitration, security and disarmament, an addendum to the Covenant of the League of Nations. It was entitled "Protocol for the Pacific Settlement of International Disputes." Owing to the opposition offered to the scheme by the Dominions, Great Britain was unable to accept the Protocol which accordingly lapsed.

PROTON. See ATOM; CHEMISTRY; ELECTRICITY.

PROTOPLASM, *pro' to plaz'm*. A colourless, syrup-like substance, the physical basis of living matter, both plant and animal. The unit of structure in all plant and animal tissues is the cell, which is protoplasm enclosed by a membrane. Some cells are surrounded by a wall, which is hard in plants and soft in animals. Most cells consist of two sections, denser protoplasm in the centre, called the *nucleus*, and thinner protoplasm outside, called *cytoplasm*. Both nucleus and cytoplasm are very complex (see CELL). The cell membrane protects the protoplasm from surrounding material, and controls the interchange of food and waste products. Similarly, the membrane of the nucleus permits exchanges between its protoplasm and that of the outer part.

Protoplasm is not one particular substance with a definite chemical composition. It is a mixture of several different compounds, whose composition varies from one cell to another or from tissue to tissue. The most important constituents are proteins, compounds of carbon, hydrogen, oxygen and nitrogen. Sulphur, phosphorus, and other mineral are found in protoplasm, and water is present in large amounts. In some protoplasm, fat and carbohydrates are associated with the proteins; these compounds contain no nitrogen. Carbon is apparently the essential or key element in whatever compounds are present.

The general properties of protoplasm are exemplified in the activities of a one-celled animal like the amoeba. This minute creature—itsself simply a mass of protoplasm—has the power of spontaneous movement; it is irritable, that is, responsive to changes in temperature and other stimuli (the sense of feeling in elementary form); it can assimilate food and throw off waste matter; it breathes; and it reproduces itself by cell division. See BIOLOGY.

PROTOZOA, *pro' to zo' a*. A class which contains all one-celled animals, such as the amoeba. These are the lowest forms of

animal life. The name is derived from the Greek and means "first animal." Most protozoans can be seen only with a microscope, and nearly all live in water. The vital functions are performed by them in the most elementary way. In the case of the amoeba and others of its type, the processes of eating, breathing and feeling are carried on by the entire cell-mass, for there are no special organs. Other classes of protozoa have specialized cell organs for these functions, such as the hairlike cilia of Infusoria, used for locomotion; and the mouth openings, with pulsating membranes and skeletal supports, seen in other types.

Some protozoans reproduce by an even cell division, each half of the original cell becoming a separate animal, with others, the parent cell puts forth a protuberance which breaks off and forms a new organism. This process is called *budding*. Certain parasitic forms, such as the organism that causes malaria when introduced into the blood of a human being, multiply by dividing simultaneously into many smaller cells called spores. In all these cases, however, there occurs a regular and even division of the *cell*.

The oceans contain countless millions of protozoan organisms which are an important source of food supply for marine animals. Many of the ocean protozoans have the body cell enclosed in a tiny shell of wonderful delicacy and beauty (see *RADIOLARIA*). The fossil shell of marine protozoa, sinking to the bottom of shallow water, over long ages, have formed chalk and limestone. See *AMOEBA*, *INFUSORIA*.

PROUD FLESH. See *GRANGLATION*.

PROUDHON, *pro dōN'*, PIERRE-JOSEPH (1809-1859). A well-known French socialist, born at Besançon and educated in the college there. After an unsuccessful attempt to establish a printing business, he turned to literature and published, in 1838, his *Essai de Grammaire générale*. Two years later he wrote *What is Property?* wherein was contained the socialistic answer, "Property is theft." In 1842, on the appearance of another publication of the same type, he was prosecuted at Besançon, but was acquitted. In 1848 he went to Paris and took an important part in the revolution of that year. He felt that the people were unprepared for the revolution, and that, had it come a little later, more complete reforms might have been effected. His views as published in the papers which he edited, were more influential than his work in the Constituent Assembly, of which he was a member. In 1849 he tried to found a People's Bank, but was forced to close the institution and remove to Geneva because of the opposition

of the authorities to his theories. On his return, his violent utterances led to his imprisonment for three years.

Proudhon's theories aimed at social and economic reforms, rather than political. He believed one person's time was equal to another's, and, therefore, that remuneration should be the same for eight hours of ditch-digging as for eight hours of plumbing. Property and capital were his main points of attack; he declared them wrong because they profited without labour, and received without giving. Proudhon believed that a point would soon be reached in the moral progress of man when government would be no longer necessary. He declared government an oppression. Anarchy, he taught, was a system whereby all the restraint came from within man, and order was maintained by good manners and not by outside interference or arbitrary regulation.

PROVENÇAL, *pro vah.N' sal*, **LANGUAGE AND LITERATURE.** The form of speech and writings of the people of medieval southern France, particularly of the region called Provence. This is the *langue d'oc*, which was superseded as the literary language of France by the *langue d'oïl*. These languages took their names from the word for "yes," which was *oïl* in the north and *oc* in the south.

In the early part of the Middle Ages, Provençal poetry (see *TROUBADOUR*) had considerable vogue in Europe, and there have come down to us the lyrics of more than 400 poets of that school. Most of the poems were love lyrics, peculiar to life in the Middle Ages, and sung to the court ladies of southern France. Another type was a moral, religious, or political theme written to the tune of a popular air. Students of medieval life find these poems interesting sources for the history and manners of the people.

The Provençal language as a literary medium began to decline about the year 1200, but it never wholly died out, and in the nineteenth century a society of literary men was organized to labour for its restoration. Many French poets of high rank have figured in this movement—the society is called the *Félibrige*, and its members the *Félibres*. The language used by these modern Provençal poets is not that of the medieval troubadours, but represents several modern dialects that have developed from the original tongue of southern France. The most famous of modern Provençal poets was Frédéric Mistral, author of *Mireio*.

PROVENCE, *pro vah.N' sal*. Region in southeastern France between the Rhône and the Italian frontier, covering an area of 9000 sq. miles. It was the first territory in Gaul to be occupied by the Romans. After experiencing the rule of individual monarchs and

counts, Provence passed to France in 1482. Physical conditions vary much, but the climate is mild, with winter rain and warm, dry summers. Upper Provence is an Alpine

winter climate has made the coast, known as the Côte d'Azur on the Riviera, a great winter holiday resort. Hotels, villas and towns such as Cannes, Antibes, Nice and Mentone line the coast. Monaco, with Monte Carlo, is an independent principality. The Rhône lowland is an extensive alluvial plain of much fertility, except in the swampy areas of the delta, the Camargue and the Crau. Avignon, Tarrascon and Arles were all more important in the past than to-day; there is, however, canal connection from Arles to Marseilles. The present towns of importance are Marseilles (population 800,881), the chief port of France, and Toulon (population 133,263), the principal naval port.

PROVERB. A short, terse sentence, often on people's lips, which expresses some truth or some bit of practical wisdom. Sometimes a proverb may be the saying of one man, which has been generally adopted and made a part of everyday speech, far more frequently it is the product of many minds, built up in some what the same way as the ballad or folk epic.

Every language, so far as known, has proverbs, and frequently the same one is found current among several different peoples. In some instances, these may all be traced to a common source, or at least a common source may be inferred, but in other cases, similar experiences and observations by widely separated peoples account for the similar proverbs.

The Bible contains an entire book of Proverbs (see below), and many of those which are most common are from that source.

Outside the Bible, no other book contains so many proverbs as *Don Quixote*. These were not all invented by Cervantes, but collected by him from the sayings of the peasants. From the poetry of Shakespeare and Pope are derived many sayings which have become proverbial.

PROVERBS. A book of the Old Testament containing a collection of short poems, epigrams, and proverbs, known as the "Wisdom Literature," and having for its purpose instruction in the choice of wise rather than wayward living.

The typical proverbs are clear in their expression, are marked by brevity, and many are written in the Oriental style known as parallelism.

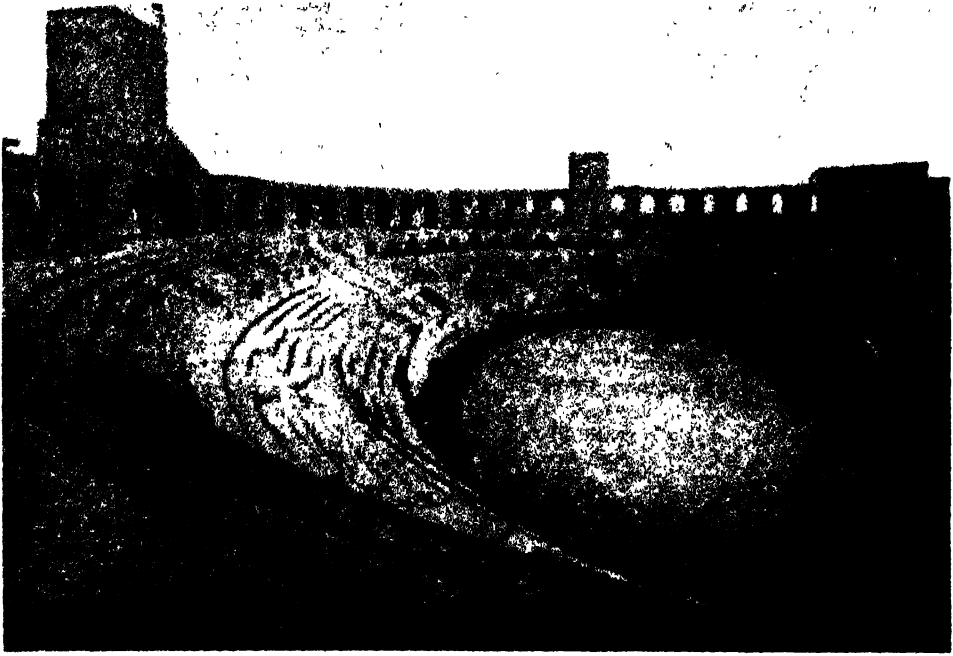


ANCIENT PROVENCE

L'Arc de Triomphe at Orange (above) is one of the finest Roman arches in Europe, and testifies that this town, like many others in Provence, was once an important Roman settlement. Below: The peaceful avenue known as Les Aylscamps is a Roman cemetery, for, like the Via Sacra outside Rome, it is lined on either side by tombs. The French name is probably derived from the Latin words *Elysii Campi* (Elysian Fields), the Paradise of the Romans.

Photos: J. E. Aulair Mellet, courtesy F.T.O.

region, including the basins of the Middle Durance and the Var; in the main it is a limestone country of sparse population, except in the valleys where the vine and olive are cultivated. Lower Provence is a coastal region where the Alpine folds come down to the sea, giving a succession of bold promontories, small creeks, and isolated fertile plains with many small harbours but poor access to the interior. Terrace cultivation is common; olives, vines and wheat are now supplemented by oranges, lemons, early vegetables and flowers. The warm sheltered



LES ARÈNES, ARLÈS

The well preserved Roman amphitheatre in this city of Provence holds over 25,000 people

Photo. Marcel Barnault, courtesy F.T.O.

Though ascribed by tradition to Solomon, the book of Proverbs is thought by modern scholars to have been written by different authors and at different times, and to represent an assemblage of several collections.

PROVINCE (Latin *provincia*). Originally, a conquered district which was governed by an official sent out from Rome. The name came from the same root as the verb *to conquer* and thus could not be correctly applied to a free and independent state, but this shade of meaning was lost, and in the Middle Ages, sovereign states which united to form a greater state sometimes made use of the name. Thus Holland, after it freed itself from Spain, was called the United Provinces. In modern times, in certain European countries like Italy and Spain, a province is one of the units into which the country is divided for purposes of local government. The term is also used to denote one of the divisions which go to make up the Dominion of Canada.

PROVOST, *prov' ost*. The Chairman of a Burgh Council in Scotland. His counterpart in England and Wales is the Mayor (which see), but he differs from the English Mayor in that he is elected for three years instead of one. In Edinburgh, Glasgow,

Aberdeen, Elgin, and Perth he is known as the "Lord Provost," and the Lord Provosts of Edinburgh and Glasgow enjoy the privilege of the title "The Right Honourable."

PROVOST CORPS. The corps of military police which exercises functions very similar to those of the civil police, such as traffic control, prevention of crime, enforcement of orders and regulations, ensuring that camp sanitation rules are observed, and prevention of pollution of water-supply on manoeuvres or active service. The Provost Corps, under the orders of the Provost-Marshal, is responsible also for the apprehension and custody of offenders, until they can be handed over to their own unit. Detachments of Provost Corps are stationed at all large military stations, and are organized on service into *provost companies* and *provost sections*. In addition the Corps takes over prisoners of war from fighting troops, assists in the civil control of occupied enemy territory and in the investigation of complaints made by the inhabitants against the troops, and carries out police duties in docks and on railways under military control.

Provost-Marshal. In peace, commander of the Provost Corps, in war responsible for preservation of order and execution of

sentences; in the Navy, a petty officer in charge of prisoners.

PROXY. To vote by proxy is to vote by means of a duly authorized substitute. In almost all limited companies, shareholders and debenture-holders are allowed to vote by proxy, so as not to deprive of their voting power those who are unable to attend meetings in person. The person who casts the vote is the proxy, and the paper which authorizes him is also known by the same term. Proxies must be in the form prescribed by the company's Articles of Association and must be signed over a rd. stamp.

PRUNE. Certain kinds of plums especially adapted for drying. The term is generally applied only to the treated product when ready for marketing. A prune plum is one that can be dried unstoned without fermentation around the stone; it also contains considerable solid matter, including a high percentage of sugar. The most famous French prunes come from the valley of the Loire; they are a golden-yellow, nearly transparent, and are very expertly dried and attractively packed. Other countries producing prunes include Spain, Portugal, Germany, Bosnia (in Yugoslavia), South Africa, and Australia. In the United States, California has the largest output of prunes.

For successful production of prunes, a warm climate with an abundance of sunlight is needed. The trees blossom in early spring, and are sensitive to the effects of frost. The fruits are harvested in August. They are allowed to ripen on the trees and to drop to the ground of their own accord, after which they are gathered, placed in wire baskets, and dipped in weak lye solution. This process cracks the skins and facilitates drying. After dipping in clear water to rinse, they are usually dumped on a pricking table, where they are pricked and sorted. The fruits are then arranged on trays and exposed to the rays of the sun, or the moisture is evaporated by artificial heat. After the drying operation, the fruits are dipped into a boiling solution of glycerine and prune juice, then steamed and dried in a revolving cylinder.

Prunes are a wholesome, nutritious, and inexpensive food. They contain vitamins A and B, are composed chiefly of carbohydrates and water, and have a fuel value of 1160 calories per pound.

PRUNING. The shortening of branches or shoots of trees, shrubs or herbaceous plants, with a view to increasing their production of flowers or fruit by curtailing their vegetative energies. In some cases, root pruning is also carried out with a similar end in view.

Fruit trees are pruned according to the way in which they bear their fruit, for in some it is borne on the new shoots, in others only on the older wood. Apples and pears, for instance, are pruned by cutting back the side shoots to within three or four buds of the main branches; the Morello and certain other kinds of cherries, which bear on young shoots, should have older wood removed.

Pruning should always be carried out with a very sharp knife or shears, and cuts made upwards at about 45°. The usual time is late spring. Young rose and fruit trees may be pruned hard to ensure that their shape is good, while hedges are pruned by clipping four or five times during the growing season.

Before pruning, the bush should be examined and all dead wood and weakly shoots should be entirely removed.

PRUSSIA (in German, *PREUSSEN*). Previous to 10th November, 1918, the largest of the four kingdoms which, with twenty-two smaller divisions—grand duchies, duchies and principalities—formed the German Empire. Since that time it has been a Republic. Although Prussia lost about 21,644 sq. miles of territory and a population of 4,601,626 (according to the 1910 census), as a result of the Treaty of Versailles, it still remains by far the largest in area (114,118 sq. miles) and population (39,006,920) of all the states of the German Republic, and it is of course the most important economically, politically, and historically.

Land and People. Three-fifths of the people of the German Republic are inhabitants of Prussia. The inhabitants include the High Germans of the south-western uplands, the Low Germans of the northern plain, many Poles, Czechs, Wends, and Mazurs in the eastern provinces, and Danes, Dutch and Frisians in the north-west.

The rural population has been steadily decreasing, owing to the great industrial development in the urban centres, and over one-half of the population now lives in cities. Berlin, the third city in the world in population, has 4,236,416 inhabitants. Cologne, Breslau, Frankfurt-on-Main, Düsseldorf, Charlottenburg, Hanover, Essen, Magdeburg, Dortmund, Königsberg, Stettin, Duisburg, and Kiel are other important cities. See GERMANY.

Prussia's coast, which before the World War extended over 1100 miles on the North and Baltic seas, was broken by the loss of territory now called the Polish Corridor. The detached portion, the province of East Prussia, has an area of 15,061 sq. miles and a population in 1933 of 2,333,301. Prussia is the only division of Germany bordering the sea, and consequently it

occupies the most conspicuous position in Germany's commerce and fisheries.

The eastern plain bordering the Baltic is a region of extremes of temperature. Its main crop is potatoes, which constitute one of the chief foods of the inhabitants, and are used also in the manufacture of alcohol for industrial purposes. The low, sandy coast is bordered by numerous shallow lagoons, and is separated from the inland regions by a belt of forested and lake-studded hills. At the mouth of the Oder is situated Stettin, the chief port on the Baltic.

The central section of the plain is a region of lakes and waterways, and here are situated Berlin and others among Germany's great industrial cities. The valley of the Oder, the most fertile region of Prussia, produces great quantities of cereals, especially rye, three-fourths of Germany's total production comes from the fields of Prussia.

The Rhine provinces are the vineyard of Germany. Along the banks of the Lower Rhine there are important manufacturing cities, such as Essen, Dortmund and Elberfeld. In the highlands to the south are great coal-mines, and numerous metals, including iron, silver, copper, nickel, and lead, are also mined there, Prussia leading all the German states in the production of minerals.

The geography, separate industries, transport and commerce are further described in the article on GERMANY.)

Government. Prussia was the all-powerful state in the pre-War German Empire, because it was the largest, the richest, and the most aggressive. Also, it was dominant because the king of Prussia was the hereditary emperor of the country as it existed until November, 1918. However, by the Constitution of the newly-made German Republic, the position of Prussia was subordinated to that of the German Reich, and the predominance which Prussia enjoys to day is by virtue of its size and the preservation of its unity.

The victorious National-Socialists seized the government in January, 1933, and set aside the constitution. Prussia's conversion

to National Socialism was largely the work of General Goering (see GOERING), who received the office of Premier of Prussia.

HISTORY

Origins of the Kingdom. The history of Prussia till 1918 is the story of the great House of Hohenzollern, which ruled it from its earliest beginnings. In the fifteenth century, Frederick of Hohenzollern was made the Elector of Brandenburg, a vassal state of the Holy Roman Empire. The duchy of East Prussia, which had been a subject state of Poland, was added to the possessions of the Hohenzollerns of Brandenburg in 1618, and other territories were acquired by the Great Elector Frederick William (1640-1688).

Prussia first made itself known in European affairs when, in 1675, the Swedes invaded Brandenburg, and Frederick William, at the time campaigning in France, returned and succeeded in driving the enemy out of Pomerania. The conquered terri-

tory had to be given up four years later, but the effect of the episode was not lessened. At a time of intense religious controversy, Prussia became a haven for the persecuted of every creed, and when Louis XIV revoked the Edict of Nantes, Frederick William retaliated with the Potsdam Decree. As a result, immigration into Prussia increased the population about one-third. Furthermore, under the Great Elector the scattered possessions were united, and Brandenburg became the leader of the Protestant states of North Germany. He was the first of the three great rulers who laid the foundation of the militarism of modern Prussia—a spirit due in many respects to its geographical position.

Rise to Leadership of Germany. In 1701 Leopold I, Holy Roman Emperor, seeking the aid of his vassal princes in the War of the Spanish Succession, established a kingdom in Brandenburg and Prussia, and Frederick III, the son of the Great Elector, was crowned Frederick I, "King of Prussia." The second king of Prussia was Frederick



ALLENSTEIN CASTLE, EAST PRUSSIA
Photo German State Railways

William I, who left an army of 80,000 of the best-trained troops in Europe and a full treasury—thanks to his close economy—to his son Frederick II, called the Great.

The first part of the reign of this sovereign was given up to successive wars with Austria for the possession of Silesia (see SEVEN YEARS WAR). The latter part of his reign was a period of political reorganization and development of the resources of the kingdom, and the progress of Prussia awakened all of Germany to new life and patriotism.

In the first partition of Poland among the European powers, the larger part of the province of West Prussia was added to the kingdom, thus uniting Brandenburg, Pomerania and East Prussia. The next king, Frederick William II, who came to the throne in 1786, lost to France the Prussian territories west of the Rhine, but during his reign, the kingdom profited by the second and third partitions of Poland.

In the reign of Frederick William III, who succeeded to the crown in 1797, Prussia was crushed by the forces of Napoleon, who saw this growing power as a menace to his progress. The Treaty of Tilsit, in 1807, reduced Prussian territory by about half, but in spite of the devastation Napoleon left in his path, he stirred the people into a national awakening, and in the final coalition wars against Napoleon, Prussian soldiers rendered valuable service. By the Congress of Vienna, most of Prussia's possessions were returned, while valuable territories on the Rhine were added as compensation for losses.

A Factor in Europe. Frederick William IV, who reigned from 1840 to 1861, was moderate and even reactionary in his tendencies, but in 1848, when the tide of democracy rose high throughout Europe, he granted the people a legislative assembly; they were not content with halfway measures, and rioting, especially in Berlin, continued until the king yielded. A constituent assembly met in Berlin, but its extreme measures frightened Frederick William. He adjourned the convention to meet later in Brandenburg, and on 27th April, 1849, dismissed it entirely, himself framing a constitution much less democratic.

Meanwhile, the Frankfurt Parliament, whose business it was to decide whether Austria or Prussia should be the leader of the German states, met and passed a resolution in January, 1849, declaring that one of the reigning German princes should be elected to bear the title of Emperor of Germany. Prussia's prince was the most likely candidate, and the crown was thus extended to Frederick William, who refused it because it came from the people and not their rulers.

Upon the accession of William I, in 1861, Bismarck became the dominant figure. It was through this statesman that the United German Empire was brought into being, and by the war of 1870-71 Germany made herself the dominant factor in continental politics. The process of Prussianizing the newly acquired territory, adapting the country to the economic and social changes of the industrial revolution, and the development of a strong and powerful state occupied the time and efforts of the Prussian people up to the World War. William II was the last king of Prussia, and the last of the Hohenzollern dynasty. He came to the throne in 1888, succeeding Frederick III, who only reigned 100 days, and immediately he showed a disposition to rule the country himself and not to be dominated by a Chancellor. The spectacular career of this aggressive ruler was ended by Germany's defeat in the World War, and after this date Prussia's history is that of Germany as a whole.

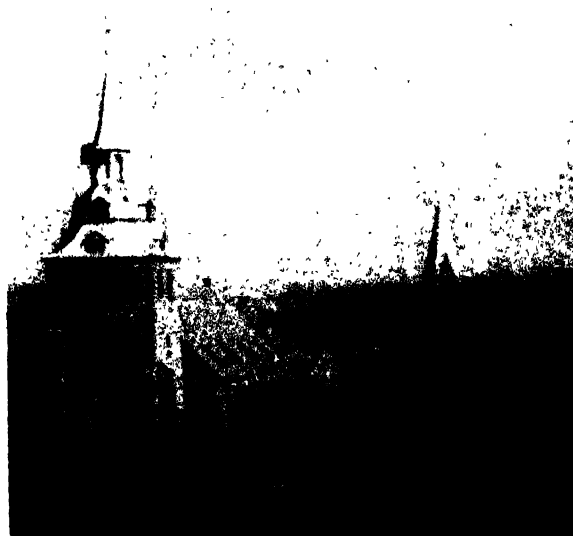
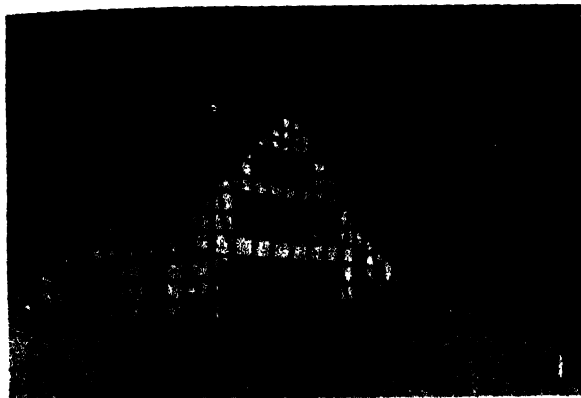
PRUSSIAN BLUE. A dark-blue solid substance of coppery lustre formerly employed to a large extent in the manufacture of bluing, paint and blue ink. Aniline products, however, are replacing Prussian blue for these purposes (see ANILINE). The chemical is a compound of iron and cyanogen. It is prepared commercially by mixing ferrous sulphate and potassium ferrioxalate, and oxidizing the product. Prussian blue does not crystallize. It is insoluble in water, but alkalis will decompose it.

Chemical Formula. The formula for Prussian blue is $\text{Fe}_4(\text{CN})_{12}$, indicating a molecule composed of seven atoms of iron and eighteen of cyanogen.

PRUSSIC (HYDROCYANIC) ACID. A compound of hydrogen, carbon and nitrogen, called *prussic acid* because it was first obtained from Prussian blue. The pure acid is a clear liquid, so volatile that if a drop of it is placed on glass, a part of the drop will be frozen by the cold produced by the rapid evaporation of the liquid. Prussic acid has the odour of peach blossoms or bitter almonds, and is one of the most poisonous substances known, in either liquid or gaseous form, paralysing the heart and muscles of respiration. Its most important compound, potassium cyanide, is extensively used in extracting gold from ore by the cyanide process.

Chemical Formula. The formula for prussic acid is HCN : a molecule contains one atom each of hydrogen, carbon, and nitrogen.

PRYNNE, WILLIAM (1600-1669). Puritan author. His most famous work, *Histrio-Mastix, or a Scourge for Stage Players* (1633), was an attack on the popular amusements of the day, most of them innocent enough.



SCENES IN PRUSSIA

1. Old knife-grinders' work-shop where water power is still employed. 2. Old farm buildings built in 1663. 3. General view of Lüneburg from the Kalk mountain. 4. Old warehouses in Königsberg. 5. Girl workers in an East Prussian amber works. 6. The Castle at Königsberg.

Photos: German State Railways

For this work Prynne was fined £5000, pilloried, and deprived of his ears. There was no suppressing him, however, and he continued to write even in prison. When Cromwell came to power Prynne ought to have been content, but all his life he found it difficult to agree or be agreeable. He soon quarrelled with Cromwell, and was again imprisoned; but at the Restoration he was appointed Keeper of the Records in the Tower, and there he worked in peace until his death. He wrote almost 200 books and pamphlets.

PRZEMYSŁ, *pshem' ishl*. Fortress town of Poland, formerly Austrian; besieged and taken by the Russians in 1915, recaptured by the Austro-Germans; awarded to Poland, 1919. Population (1931) 51,379.

PSALMS, *sahms*. One of the books of the Old Testament, containing the religious poetry of the Hebrews, including the hymns and prayers used in public worship. There are 150 psalms, divided into five books.

The psalms are recognized as beautiful lyric poems, both in their form, which is largely that of parallelism, and in their expression of the finest emotions.

The date of composition of the psalms, the compilation of the book and its authorship, are matters of conjecture. Practically all critics agree that the traditional theory that David wrote all of the psalms is unfounded.

PSALTER, *saul' ter*. Anglicized form of the Latin word *Psalterium*, book of the Psalms, as used in the church for liturgical purposes. The *Psalterium* was one of the separate books used in the services from early times, and contained a translation of the whole of the psalms into Latin by Saint Jerome in 392. This book was known as the *Psalterium Gallicanum*, through its circulation in Gaul, a copy having been sent to Tours in the sixth century. A manuscript of this version is preserved at the Vatican dating from the seventh century, and containing in addition the Canticles of the Three Children (*Benedicite* in the English Prayer Book) and of Moses. The British Museum possesses a *Psalterium*, which was long supposed to have been one of the books brought to Canterbury by Saint Augustine, but is now known to have been written in England about the beginning of the eighth century. Other famous *Psalteria* are that of Saint Gall (the *Psalterium Aureum*, or Golden Psalter), and that of Utrecht, both said to be of the ninth century and richly illuminated.

When the reformers in England resolved to combine into one the various liturgical books then in use, they incorporated into it a translation of the Psalter into English. This was not taken from the Latin, but from the so-called "Great Bible" of 1539-1541,

the text of which was a revision by Coverdale of translations from the Hebrew and Greek.

The version of the Psalter inserted in the first Prayer Book of Edward VI was in all essentials that of the Great Bible, and so it remains at the present day.

PSITTACOSIS, *sit' ta ho' sis*. A disease spread by parrots. See PARROT.

PSYCHE, *si' ke*. In Greek mythology, a princess whose beauty was so great that it aroused the jealousy of Aphrodite, who called her son Eros (Cupid) and ordered him



either to kill Psyche, or to make her fall in love with some hideous wretch. When the youthful god saw the beautiful maiden, he fell in love with her himself, and made her his wife.

As Eros represents the heart, Psyche was thought to typify the human soul, and the trials through which she went were symbolic of the struggles through which the soul must go before it is made pure. The Greeks used the word *psyche* to mean both "butterfly" and "soul." They thought of the emergence of the butterfly from the chrysalis as a symbol of the soul leaving the body. See EROS, CUPID.

PSYCHIATRY, *si ki' at ri*. A term used in two senses. It is used, as for example in connection with child guidance work, for the psychotherapeutic treatment of a great variety of mental abnormalities. The meaning is here equivalent to that of "psychotherapy." In a more limited sense it is used

for the treatment of psychotic or insane conditions. See CHILD GUIDANCE; INSANITY; PSYCHOTHERAPY.

PSYCHICAL, si' kík al, RESEARCH. In 1882 the Society of Psychical Research was founded to investigate certain matters that have always been of interest: phenomena suggestive of the operation of powers beyond the recognized use of the senses and the accredited behaviour of matter and mind. The investigations were to include the traditional beliefs in premonitions, haunted houses, occurrences in the presence of mediums, such peculiar states as trance, hypnosis, and the existence of seemingly supernatural forces transcending the known laws of matter.

The most definite problem was that of the transference of thought apart from the ordinary channels, for which the term *telepathy* was adopted. Persons appeared claiming such powers; experiments were conducted on a large scale, in which the successes of such "percipients" in guessing numbers, names, or cards were carefully recorded, and the conclusion was reached that, after allowing for chance, a proportion of success remained that implied an authentic transfer. Yet although critical students have subscribed to these conclusions, they cannot be said to be generally accepted. Of the elements that may account for the results, the most perplexing is the question of fraud, intentional and unintentional. Distinctly fraudulent methods were discovered by members of the society, and such results were disregarded, in a number of cases, however, confessions of fraud were made even after the results had been accepted as genuine. Apart from the "money" interest, the desire for notoriety and the interest in deception act as motives for frauds. In such experiments, the proper allowance to be made for chance is not easily determined, the mental habits of two persons may be sufficiently alike to cause apparent transfer.

A truly formidable amount of evidence has been amassed of "veridical" *premonitions* and *apparitions*, that is, such as correspond to actual happenings. A person at a distance has a sudden and strong feeling that something momentous is happening to a friend, quite as commonly, an actual feeling of his presence or the apparition of a form is reported. Later reports in many cases prove that something momentous had really occurred; and frequently a premonition or apparition fairly coincided with the moment of death of the absent friend. To this class of cases, the theory of telepathy was applied.

Such cases, however, offer large room for sincere error; some such coincidences must

occur by chance; and cases depending upon written records made before verification are rare. Much reliance is placed, by those who accept the evidence, upon the accuracy of details, some seemingly unknown to the percipient until the moment of the premonition or apparition. Some favour the hypothesis of spirit communication. However, the scientific conclusion is, in view of the extreme uncertainty of the evidence, and of the negative result of experimental proofs, that the case is not proved. A tendency among unstable or neurotic individuals of certain types to seek for such phenomena is fairly clearly established.

An interesting and more decisive branch of investigation embraces physical phenomena, occurring mostly in the presence of spiritualistic mediums, such as the mysterious movements of objects, the writing on slates apparently out of control of the medium, answering of questions in sealed envelopes, materializations, spirit photographs, etc. (see SPIRITUALISM). Most of these have been found to be fraudulent. A slight departure from accuracy of description is sufficient to make a miracle out of a plain tale, and expert knowledge is required to detect the fraud in operation.

The investigation of haunted houses, especially the cumulative accounts of different observers, is too complex to be summarized. It has convinced some, and seems inconclusive and suggestive of delusion to others.

Of a different type are the revelations by *mediums*, in the trance state, of affairs seemingly beyond their knowledge by any ordinary channels, often private matters of an intimate character, upon which reticence is most natural, are thus revealed. It is to be noted that such revelations are made by a few individuals, often under questionable circumstances, involving at once the suspicion of lack of good faith or of hysterical varieties of deception. Communications with those recently departed and interested in the reality of such phenomena are recorded. Spirit communication has been accepted by some investigators as the only adequate hypothesis, while others regard telepathy as adequate. It is clear that, unlike material phenomena which can be examined and exposed, this type of evidence depends wholly upon the co-operation of the "medium," who as a rule has been unable or unwilling to furnish enlightenment on the provenance of his information.

The problems of psychical research have included a miscellaneous group of exhibitions of unusual powers, of which "crystal-gazing" is an example. The ability of favoured individuals to promote subconscious images,

and by this means to project in pictures seen in the surface of a glass ball incidents seemingly beyond the normal knowledge, is unmistakably established. Those convinced of the telepathic or similar action see in these revelations additional proofs of their views. That the action falls into line with what is known of unconscious mental functioning is, however, the more scientific hypothesis. The same applies to "automatic writing." See DIVINATION.

Summary. In reviewing the many problems of psychical research, it becomes evident that most of them pertain to the same powers as dominate the history of occult pretensions, such as clairvoyance, power to control matter at a distance and defy the laws of physics, spirit revelations, oracles, ghosts, trance states, and the like. The presumption remains that the methods and agencies responsible for such appearances in the past (which have been proved to be largely pretence, or capable of reasonable explanation within the accepted range of scientific hypothesis) are adequate to account for nearly all of the more circumstantial evidence recently accumulated.

This conclusion remains the present verdict of a scientific caution. Of special interest is the relationship of the phenomena considered as psychical to phenomena occurring in pathological mental conditions. Trances, trance-like states, visions, voices, and supernatural communications and automatic actions of various kinds are all to be found frequently among mental patients. Their similarity to many of the phenomena of psychical research is unmistakable, and it seems likely that similar unconscious mechanisms are at play in both cases.

Whether one believes that the enormous labour expended in the accumulation of these data has been worth while depends upon the significance attached to the results. The issue seems to be between (1) the view of the universe as regulated by well-ascertained laws of cause and effect in the field of mind and matter, while under peculiar circumstances, at the agency of favoured individuals, quite another realm of action takes place, transcending or defying these laws and revealing relations unrecognized in ordinary science; and (2) the view that holds firmly to the all-encompassing scope of science, and holds that the seeming exceptions may eventually be accounted for by extension of known forms of material and mental action; allowance being made for coincidence and the scope of fraud and self-deception.

PSYCHOANALYSIS. Psychoanalysis was developed by Professor Freud of Vienna at the end of the nineteenth century as a

method of treating neurotic illnesses. At the time when Professor Freud first studied the neuroses, the most successful method of treatment was through hypnotism. It had been discovered that it was often possible to hypnotize a patient and, while under hypnosis, to cause him to recall forgotten incidents and experiences connected with his illness. The recalling of these lost experiences and the working off of the feelings associated with them often produced startling cures. However, Professor Freud realized, as is now generally accepted, that the method of hypnosis had grave drawbacks. In psychoanalysis, however, he was able to retain the valuable features of this form of treatment while discarding the hypnosis with all its disadvantages. He did this by developing the method of *free association*. The patient was not hypnotized, but, while lying quietly in a non-disturbing environment, was asked to give all the ideas that came to his mind, no matter how absurd, unpleasant or unseemly they might be. Anyone who tries the experiment of observing quietly what comes to his mind under these conditions will soon realize that these trains of ideas lead back to the fundamental impulses of our nature. Among these, sexuality and hate and aggression are found to hold a position of outstanding importance.

Professor Freud found that through the method of free association he was able to explore the forgotten experiences connected with the development of the illness quite as well as by hypnosis. The method had the advantage that it could be applied to all patients, while only in certain cases was it possible to induce hypnosis, and there was not the tendency toward relapse after an apparent cure which was found with the hypnotized cases. He found that the trains of ideas produced led him to the fundamental instincts of his patients, their sexual and aggressive instincts, and that peculiarities in the development of these instincts were the important determinants of the illness. He brought to light these peculiarities, caused the patient to recall the painful experiences of his past life, discharge the emotion connected with them, face them and acknowledge them. In doing this the illness itself was mastered and disappeared.

The method of free association used in the early days has remained an essential feature of the technique of psychoanalysis up to the present time. We see that, essentially, psychoanalysis is a method of treatment and so constitutes a branch of medical psychology. The method itself, however, involves a thorough exploration of the human mind, including not only those thoughts that

are conscious or readily become so, but also the tendencies and ideas that are unknown to the patient and are only revealed by a special technique, such as that of free association. Thus, besides furnishing a method of cure for various forms of illness and abnormal development, psychoanalysis has brought about great advances in psychological knowledge.

Relation to Psychotherapy and Psychology.

It may be well to note one or two points in connection with each of these aspects of the subject—the psychotherapeutic and the psychological.

The therapeutic aspect may be taken first. An early development of this involved close attention to the patient's dreams. These were found to form ready clues to the more obscure mental mechanisms; by the use of free association it was found possible to interpret the dreams and reveal the mechanisms at work. The patient related the dream to the physician, and the ideas associated with the incidents of the dream were found eventually to lead back to the motives that prompted it. The analysis thus brings the patient to recognize motives operative within his own mind that are ordinarily hidden from him. These motives reveal themselves under the guise of the dream during sleep. See DREAMS.

An outstanding advance in psychoanalysis as a form of therapy is the increased understanding of what is known as *transference*. By this is meant the emotional relationship of the patient to the physician. The free associations given by the patient lead back very quickly to earlier phases of his life and eventually, in successful analysis, to the first years of childhood. As he lives over again the events and emotions of the past he transfers on to the analyst the feelings, the loves, fears, hatreds, and so on, that were originally associated with the people that he knew and have remained throughout his life powerful determinants of his behaviour or of his illness.

In quite recent years a new development in psychoanalysis has taken place in the treatment of neuroses in young children. The free association method has here been abandoned as it is not practicable or useful. Instead, the child's free play is studied and interpreted. It is found that the play of the child reveals its motives and mental mechanisms in a way closely analogous to free association in adults.

Of the psychological advances brought about by psychoanalysis, one of the most important is the knowledge that it has given of the unconscious workings of the mind. (See COMPLEX; UNCONSCIOUS.) Psychoanalysis has shown us that the motives of

which we are not ordinarily conscious may be crude in the extreme; it has revealed the primitive and imperious nature of our unconscious impulses and the fierceness of our unconscious moral tendencies. It has shown, as Freud has expressed it, that the normal man is not only far more immoral than he believes, but also far more moral than he has any idea of.

See PERSONALITY.

PSYCHOLOGY, *si kol' o ji*. A study which may be defined in various ways, as, for example, the science of the mind, of mental life, or of behaviour. There is not a single, generally accepted definition of the subject, because psychologists themselves are not all in agreement as to their methods of approach. Some take it that an essential feature of the study is the careful observation of one's own ideas, thoughts, feelings, intentions, and so on. Others maintain that all such observation should be rigidly excluded. They hold that an idea, for example, is something personal, something which the person possessed of it can observe in himself and no one else can. There seems no possibility of introducing standards and measurements into observations of this kind, and so, they maintain, they should not be used. Instead, these critics would have attention devoted to the behaviour of people, to what they actually do, for this can be recorded and measured in the same sort of way as the phenomena of other sciences. The psychologists of this school are mostly to be found in America and are known as Behaviourists. Their view-point has prompted much useful research; but it is pointed out by their opponents, with some show of reason, that in excluding all that is purely mental they are setting aside something that is in itself interesting and worthy of study.

As a science, psychology has existed for something under a hundred years, and the division of opinion that has been touched upon above gives some indication of how it has developed. For it was first studied by philosophers, and the connection with philosophy remained for a long time very close. The method of inquiry here was largely that of merely thinking of what happened in the mind and endeavouring to deduce from this general laws concerned with its working. It was altogether a different study from what is known as modern psychology. The foundations of modern psychology were established with the introduction of experimental methods. This was very much helped by the increased development during the nineteenth century of the sister science of physiology. As might be expected, the closest contact was made, and the biggest take-over of methods occurred in the domain

where the two subjects meet most naturally, that of sensation. The study of the sense-organs belongs to the physiologist, but he cannot carry it through without taking account of the sensations of sight and hearing, or whatever it may be that these organs produce. The psychologist, for his part, is very much concerned with sensation, for all knowledge can ultimately be traced to knowledge gained through the senses.

In 1879 Wundt, who has been known as the father of modern psychology, founded the first psychological laboratory at Leipzig, a procedure that was soon to be followed in many other countries. Apart from sensation, perception and memory and the formation and grouping of ideas were among the subjects that gave rise to a great deal of valuable work during these early years—work that was only made possible by the use of carefully controlled observation and experiment in the laboratory.

Modern psychology shows us many great advances and an expansion of the subject in many new directions. Among the characteristics of the progress that has been made are the increased emphasis on feeling and activity and the emphasis on development. We are concerned not only with the human being as he is at any one moment, but with the course of his growth. Instinct and emotion, the formation of habit, the building up of character all receive their full share of attention. The psychologist is concerned with the person not only as a being who can think and know, but as one who responds to his environment with feeling and action, responds in a way that is determined both by his innate constitution and by the manner of his individual development.

Methods of study, too, have expanded. One of the most interesting and fruitful of the modern developments is the application of statistical methods to psychological data. This has involved experiments and observations on very large numbers of people. Whereas in the early days of the subject a psychologist usually made his observations on himself or a small number of people, in some modern researches hundreds and even thousands of people have taken part.

The range of types of individuals studied by the psychologist has greatly increased. The comparative psychologist goes to primitive people to gather his data. Those who suffer from neurosis or insanity, from mental defect or from injury to the nervous system, all come within the scope of abnormal psychology. The child psychologist studies the individual from birth onwards. The educational psychologist makes use of what is known about children and devotes him-

self in particular to those problems that are of practical importance for education (see PSYCHIATRY). Industrial psychology (which see) is another application.

PSYCHOSIS, *si'ko'sis*. Mental derangement. See INSANITY; NEUROSIS.

PSYCHOTHERAPY, *si'ko'ther'ra'pe*. Literally, mental healing or cure. It is something which we all practise at some time or another. We endeavour to "cheer up" our friends who are ill, having the belief—by no means unjustified—that an improvement in mood and a cheerful outlook will hasten recovery. In the same way we may try to cheer people who are despondent and depressed although not physically ill. By being calm and collected we reassure those who are of the apprehensive and worried type and soothe those who become unduly excited. In all this we are practising consciously or unconsciously, the form of psychotherapy known as *suggestion*. By our own manner of confidence we suggest or imply that all is well. Suggestion is thus a different thing from argument or persuasion. In emotional matters it is far more effective. The value of a suggestion depends very much on the attitude of the individual toward him who makes it. Since suggestion plays a large part in all forms of healing, we see how valuable is the authoritative position and personality of the doctor.

Suggestion probably plays some part in all forms of mental healing, but as a form of treatment for mental disorder, suggestion alone is seldom adequate. It leaves the patient too much dependent on the physician and cures are rarely permanent. Other types of psychotherapy need to be employed. The aim of these is for the most part to uncover the causes of the disorder, lay bare unconscious conflicts, recover lost memories, work off pent-up charges of emotion and so afford relief and the possibility of a more normal outlook.

The methods employed differ a good deal. At one time hypnosis was extremely fashionable, and is still used as a factor in treatment by some physicians.

There are innumerable other varieties of treatment which consist in some exploration of past history and releases of emotion, combined with varying amounts of persuasion, suggestion, re-education and adjustment of external circumstances.

The most thorough and complete method is probably that of psychoanalysis (which see). See also EMOTION; NEUROSIS.

PSYCHOZOIC, *si'ko'zo'ik*, **AGE**. See QUATERNARY PERIOD.

PTARMIGAN, *tar'mi'gan*. The name of certain grouse-like birds found in northern regions of both Europe and America. A

characteristic feature of these birds is a covering of short feathers on the feet. Most species have two changes of plumage during the year; the winter coat is a pure white, and that of summer a mixture of reddish-brown, buff, grey and black, the coloration serving at different seasons to protect the bird from discovery by its enemies. Ptarmigans nest among mosses on the ground. Their eggs, six to eleven or more in number, vary in colour from cream-buff to reddish, and are spotted and blotched with black or dark brown.

Classification. Ptarmigans belong to the family *Tetraonidae*. The species found in Scotland is *Lagopus mutus*.

PTERIDOPHYTES, *ter' ri do fites*.

The name of that division of the plant kingdom which includes ferns and mosses. It is one of four great divisions into which plants are grouped on the basis of structure. These plants have root *roots*, as well as stems, although the latter often have the habits of rootstocks. Many of them are tropical, and in the geological period, particularly in the earth's greatest coal-forming ages, they were far more abundant than they are now. See BOTANY, FERNS, etc.

PTERIDOSPERMS. A class of palaeozoic plants, intermediate between the cryptogams (ferns) and phanerogams, into which many of the fern-like plants of the coal measures, such as neuropteris, alethopteris, sphenopteris and lyginodendron, have been placed. The pteridosperms are only known fossil, but they were the dominant type of vegetation in Carboniferous times before the phanerogams had been evolved.

PTERODACTYL, *ter ro dak' til*. An order of flying lizards of a prehistoric age. Numer-

there were about twenty genera. They had hollow bones, like birds, but in other points of structure were like reptiles. The body was short, the head large, and there were two



PTARMIGANS IN WINTER

long, slender hind legs, and a pair of forelimbs. A very long tail was characteristic of earlier forms. Probably the most peculiar point of structure was the prolongation of the fifth finger of the forelimb. To this was attached a strong membrane, forming a wing which looked something like the wing of a bat. In expanse of wing, these animals varied from 1 ft. to about 20 ft.

PTEROPODA (wing-footed). A group of small pelagic molluscs marked by two lateral lobes of the foot which are used in swimming. They live in shoals and form part of the food of whales. When the shells of these molluscs fall to the sea bottom in sufficient numbers they form pteropod ooze. See OOZE.

PTOLEMY, *tol' em i*. The name of sixteen kings who ruled Egypt from 323 to 30 B.C., constituting the Macedonian dynasty. Five of them are prominent in Egypt's history.

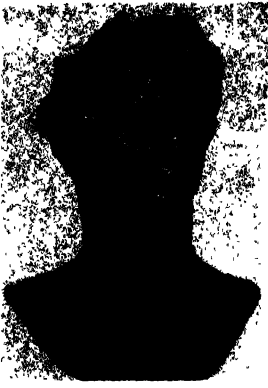
Ptolemy I, surnamed SOTER, or "Saviour" (about 367-283 B.C.), was a Macedonian Greek and a favourite general of Alexander the Great. He possessed much of the genius of Alexander for conquest and organization. After the latter's death, when the vast empire was divided, Ptolemy chose Egypt for his realm, and made Alexandria his capital. By marriage and by conquest, he extended his territory, and during his reign Egypt became foremost among nations in commerce, the clearing-house for the produce of the world. It was Ptolemy's aim to make Alexandria both the commercial centre and the intellectual capital of the world, and to this end he founded the Museum and the great Alexandrian Library (see ALEXANDRIA). In 285 B.C. he abdicated in favour of his son, Ptolemy Philadelphus.



SKELETON OF THE PTERODACTYL

ous fossil remains found in limestone formations of the Mesozoic Age indicate that

Ptolemy II, surnamed **PHILADELPHUS** (308–247 B.C.), was a peace-loving king who



PTOLEMY II

Bust from the Naples Museum

Photo: Anderson

accomplished with honour the task of carrying out his father's plans for the commercial and intellectual glory of the kingdom. Among the achievements of his reign were the opening of a canal from the upper end of the Red Sea to the Nile, and the erection of a lighthouse on the island of Pharos.

According to tradition, not well founded, Ptolemy had a Greek translation made of the Hebrew Scriptures. See **SEPTUAGINT**.

Ptolemy III (about 282–222 B.C.) was called **EUERGETES**, or "Benefactor," because he restored some Egyptian gods carried away by Cambyses. Under this progressive ruler, Egypt reached the height of its military

glory and material prosperity. Ptolemy III was a patron of learning and a famous builder.

Ptolemy V, surnamed **EPHIANES**, or "Illustrious" (210–181 B.C.), became king when only five years old. The kings of Syria and Macedonia promptly took advantage of this condition



PTOLEMY V

Bust from the Naples Mus.

Photo: Mansell

and proceeded to divide between them the foreign possessions of Egypt. The infant king's guardians called upon Rome for help. Rome forced the kings to restore most of the lands by arranging a marriage between Ptolemy and the daughter of the Syrian king, who was to have as her dowry the disputed provinces. This aid was a pretext for the Romans to increase their influence until Egypt became a Roman province. The coronation of Ptolemy in

196 B.C. was the occasion for the inscribing of the famous Rosetta Stone (which see).

Ptolemy V was succeeded by his eldest son, **Ptolemy VI**, then a child, under the regency of his mother. At her death there was a split between the Ptolemaic and Seleucid courts. Antiochus VI invaded Egypt and captured Ptolemy VI, who was succeeded by his brother, Ptolemy VII, after whose death the old Ptolemaic realm was never again an entity.

Ptolemy XII, surnamed **DIONYSUS** (about 61–47 B.C.), came to a kingship already under a Roman protectorate, and when he quarrelled with his sister-wife, Cleopatra, and drove her from the country, Caesar interfered and deposed him. Ptolemy attempted to assert his rights, but was defeated, and while endeavouring to escape was drowned.

PTOLEMY (**CLAUDIUS PTOLEMAEUS**). A famous astronomer and geographer of antiquity, whose theory that the earth is the centre of the universe was generally accepted throughout Europe until disproved by the arguments of Copernicus and the astronomers who followed him. Ptolemy was a native of Egypt and belonged to that group of scholars which flourished in Alexandria in the second century A.D.

His system of astronomy is set forth in the *Almagest*, a work of thirteen books. This theory views the earth as a globe, around which revolves the hollow sphere of the heavens, and which, compared with the heavens, is but as the point of a pin in size. Around the earth revolve the moon and sun, but in circles, of which the earth is not the centre. Seven planets, arranged according to distance from the earth, are named the Moon, Mercury, Venus, the Sun, Mars, Jupiter, Saturn.

As a geographer, Ptolemy improved and corrected the works of a predecessor, Marinus of Tyre. His *Geography* consists chiefly of a catalogue of places, with their latitude and longitude, together with certain meagre descriptive matter. This work was illustrated by a series of twenty-six maps, and a map of the world. The *Geography* was a standard textbook until the great maritime discoveries of the fifteenth century.

Ptolemy studied mathematics following the lines traced out by Hipparchus, to whom he gives full credit in his writings. The theories of trigonometry, plane and spherical, advanced by Hipparchus and explained by Ptolemy, formed a contribution to pure mathematics which remained unsurpassed many years after the Ptolemaic system of astronomy was discredited.

A treatise by Ptolemy on optics gives a theory, perhaps the first to be recorded, of refraction of luminous rays through media

of different densities and he was also the author of a treatise on music.

PTOMAINES, *tō' maynz*. Basic organic chemical compounds resulting from putrefactive bacterial decomposition of animal or vegetable matter. Through their basic properties, ptomaines bear some resemblance to the alkaloids. The Italian investigator, Selmi, in 1870, introduced the word *ptomaine* (*ptoma*, a corpse) to describe certain basic products formed in the advanced stages of protein decomposition. Further interest in ptomaines was stimulated by the researches of Gautier (1872) and Brieger (1882).

The common association of ptomaines with food poisoning is an established fallacy, and the general use of the diagnosis "ptomaine poisoning" is rapidly disappearing from medical terminology. Certain of the individual ptomaines have been shown to be poisonous when injected into animals, but it has not been demonstrated that any of them are toxic when taken by mouth. It is now well known that most attacks formerly classified by this term are due to bacterial infection. See POISON.

PTYALIN, *tī' a līn*. See PEPsin; SALIVA.

PUB'IS. See SKELETON.

PUBLICANI, *pub li kah' ni*. Persons in Ancient Rome to whom was farmed out the collection of taxes from public land or right to exercise a state monopoly. These rights were disposed of to the highest bidder at a public auction. In the later days of the Republic, when this class represented the aristocracy of wealth, as opposed to the senatorial order or aristocracy of birth, the various abuses arising from the farming out of the taxes reached a head in the provinces, since the Equites, the social order from which the publicani were drawn, controlled the criminal courts in which prosecutions for extortion had to be brought. Discontent was caused not so much by the fact that the publicans were empowered to raise what they could from their monopolies as by the fact that the State looked for exorbitant sums in payment for the rights, and depended on them. According to Livy, the first monopoly disposed of was the sale of salt, but the system was extended to cover every brand of State service. It is noteworthy that between 100 B.C. and the fall of the Republic the whole policy of the Equites was determined by consideration for the publicani.

The hatred inspired by this class in the provinces is clearly demonstrated by the frequent occurrence in the New Testament of the phrase "publicans and sinners."

PUBLIC ASSISTANCE. See POOR LAWS.

PUBLIC TRUSTEE. Owing to difficulty in finding reliable trustees to administer a

trust or a settlement, the Public Trustee Act, 1906, provided for the appointment in London of a Public Trustee who should act on behalf of the State as a trustee of an estate or an executor of a will; the Public Trustee can be named solely or jointly with another trustee or executor. The facilities afforded have been in great demand, particularly for small estates, but a considerable number of large estates have been entrusted to the Department. A branch has been opened in Manchester. There is a tendency nowadays, however, for the large banks and insurance companies to set up executorship and trustee departments, which will probably lessen the work of the Public Trustee.

PUBLISHING. A trade which has existed ever since the invention of printing, and in some forms, even in the days of manuscript books. The early printers were nearly always publishers and editors: Caxton in this country fulfilling all three functions as well as being a translator. Publishing undoubtedly furthered authorship in the fifteenth and sixteenth centuries, in which such names stand out as that of William Ponsonby, publisher of the works of Sir Philip Sidney and Spenser (with the exception of the *Shepherd's Calendar*). Publishing for a time developed at a fast rate, and when it averaged two new books a week in 1632, George Wither, a publisher, complained bitterly that too many books were being printed. The selling of copyrights by authors to publishers was then general, and there is the famous instance of Milton selling his rights in *Paradise Lost* to Samuel Simons for £5, with a promise of further similar sums as later editions were exhausted. The lapsing of the licensing laws led to such wholesale piracy of copyright and to the production of so many forgeries that both authorship and publishing nearly went out of existence in this country. For the first few years of the eighteenth century only two or three books a year were being produced, the position was restored when, in 1709, the Copyright Act, the first measure of its kind ever to be passed, became the law. Publishing has since expanded at an ever increasing rate and many great publishing houses now exist. See BOOK PRODUCTION, ROYALTY, etc.

PUCCINI, *pool che' ne*, GIACOMO (1858-1924). A composer of modern Italian opera, noted for the beauty of his melodies and his rich orchestral effects. He was born at Lucca, and while a student at the Milan Conservatorio, he heard his first orchestral work played at the school. His first ambitious composition, the opera *Le Villi*, brought him immediate recognition. In 1893 his *Manon Lescaut* was produced and won immediate success, and *La Bohème*, which

followed in 1896, was considered a still greater triumph. *La Tosca*, *Madame Butterfly*, and *The Girl of the Golden West*, produced between 1900 and 1910, showed fresh aspects of Puccini's genius. In 1926, many months after his death, Puccini's last opera, *Turandot*, was sung for the first time, in Milan.



PUCCINI
Photo. *Wilde World*

PUCK. In English folklore, a mischievous sprite or elf, sometimes known as *Robin Goodfellow*. While he sometimes tormented people in a

spirit of fun, he was seldom malicious, and did favours for those who were good to him, or who gave him presents. Puck is a prominent figure in Shakespeare's *Midsummer Night's Dream*.

PUEBLA, pueh' bla See MEXICO

PUEBLO, pueh' blo. (Spanish for village)

Name applied by early Spanish explorers to those tribes of Indians in the southwestern United States who lived in communities of adobe or stone houses and in cliff-dwellings

PUERPERAL, pu er' per al, FE-VER. A dangerous condition sometimes occurring in women after childbirth. It is brought about by the entrance of certain disease germs through wounds, often very slight, resulting from labour. It is caused by want of cleanliness on the part of the midwife or the doctor, or from retention of fragments of the after-birth (see **PLACENTA**), or in some cases by germs which have been present in the woman beforehand, ready to infect the whole system when the opportunity occurs. In former days this disease resulted in a very high rate of maternal mortality, but with modern aseptic methods the rate has been greatly reduced; though it is still so high that frequent efforts are being made by legislation to improve the conditions under which confinements take place. See **OBSTETRICS**.

PUERTO RICO, pu er' to re' ho. A West Indian island (Porto Rico) which became a possession of the United States in 1898, at the conclusion of the Spanish-American War. It has an area of 3435 sq miles and a tropical climate. About a quarter of the

inhabitants are negroes and people of mixed negro and Spanish blood. The others are chiefly whites of Spanish descent, but many Americans have acquired interests in the sugar and tobacco industries. Total population (1930) 1,543,913. The capital is San Juan, now a city of 114,715 (1930) people, and an important centre of tobacco manufacture. Other towns are Ponce (53,430) and Mayagüez (37,000)

Physical Features; Resources. A range of forest-covered hills, 2000 to 4400 ft high, stretches across the island from east to west, and slopes down on both sides to the level lowlands of limestone. Many rapid rivers furnish water power, but none is navigable for any distance

Extensive beds of guano and of phosphate are being worked. Salt deposits are found at several points on the main island. Though Puerto Rico contains deposits of gold, silver, iron, copper, tin, mercury, platinum and other materials, the mining industry is so far confined to gold and manganese ore.

All other industries in Puerto Rico are secondary to those connected with the cultivation of the soil. The sugar and tobacco crops lead in amount and value



PUEBLO INDIAN VILLAGE AT TAOS, NEW MEXICO
Photo. *Keystone*

followed by coffee. A new irrigation system has greatly increased the output and export of sugar. Bananas, pineapples, plantains, oranges, grapefruit, and coconuts are important exports.

Education and Religion. Since 1899 education has been made compulsory, and a



OLD MORRO CASTLE, PUERTO RICO

system of elementary schools is in operation.

The University of Puerto Rico is at Rio Piedras. The English language is spoken in the schools, though Spanish is taught throughout the course. In 1930 the proportion of illiterate among children was 41 per cent.

The majority of the inhabitants are of the Roman Catholic faith.

Government. For about two years following the cession of the island to the United States, Puerto Rico was under the jurisdiction of American military governors.

In 1917 the Congress gave Puerto Ricans full rights as citizens of the United States (though such citizenship was not obligatory) and a large share in the responsibility of government. The former appointed executive council was replaced by a senate composed of nineteen members, chosen by ballot by the people of Puerto Rico. A House of Representatives of thirty-nine members is also elected by the people. The Governor is appointed by the President.

History. In 1493 Puerto Rico was visited by Columbus. Ponce de Leon began its colonization, and the island remained in the possession of Spain; negroes were imported from Africa as slaves. In 1820 and in 1867, the Puerto Ricans were unsuccessful in attempts to declare their independence, and in 1870 the island was made a Spanish province; in 1897, however, the people were granted autonomy.

War was declared between Spain and the United States in 1898 and the island was evacuated by the Spanish and ceded to the

United States. In partial return for the cession of Puerto Rico and the Philippine Islands, the United States gave Spain £4,000,000.

In February, 1928, the political leaders of the island petitioned the United States to be made a "Free State" with internal sovereignty but not international independence. This was refused at the time.

On 13th September, 1928, a terrific hurri-

cane struck Puerto Rico, leaving 400,000 homeless, killing over 250 people, and crippling the island at the height of its prosperity.

PUFF ADDER.

See ADDER.

PUFFBALL.

Any one of a group of mushroom-like fungi producing a spheroidal



RESIDENTIAL DISTRICT OF PUERTO RICO

fruit-body with spores completely enclosed. Many species have a white flesh, but later this begins to discolour or become corky and is then extremely poisonous. As the puffballs mature, the interior differentiates into a mass of powdery spores, yellowish olivaceous or purplish. Sometimes the fruit breaks open irregularly, or there may be a gradual disintegration, or, more elaborately, there is developed an opening or crater in the top, through which puffs of "smoke" may be emitted, especially when the fruit is touched & compressed. This "smoke" consists, of course, of clouds of tiny spores. Puffballs may be found that vary from $\frac{1}{4}$ in. to 2 ft in diameter. The most important genus in Britain is the native *Lycoperdon*. See MUSHROOMS.

PUFFIN. A stout little sea-bird with an unmistakable red bill almost the size of the rest of its head—hence the names Coulternel and Sea-Parrot. Puffins are white beneath

and on the sides of the head; on the back, wings, top of the head and round the neck they are black.

Puffins are residents in the British Isles, where they are common on rocky coasts. No nest is made, but a single white egg is laid in any convenient crevice or burrow.

Scientific Names. The Puffin belongs to the family *Alcidae* and is *Fratercula arctica*.

PUG. The pug was a high favourite in Britain before the time of the Pomeranian which, in turn, gave place to the Pekingese.



PUG DOG
Photo: Fall

It is thought that the pug originated in China, but he was brought to England from Holland by William and Mary in 1688.

He is a square, cobby, muscular little dog, weighing about 13 to 17 lb., but unfortunately he puts on fat very easily. The face is deeply wrinkled with a decided black mask, ears thin, small and soft like black velvet, the tail curled tightly as possible over the hip—the double curl is perfection.

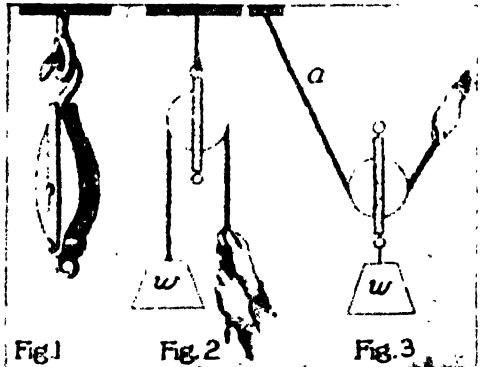
The "fawns" may be either silver grey or apricot. One of the features of the breed is the Trace—a line of black running along the top of the back from the occiput to the tail. In 1880 black pugs were introduced and became very popular. The coat is fine, short and glossy, neither hard nor woolly.

PUISNE, pruh' ni. A word meaning "latter" or "junior," obsolete except in legal language. It is applied, firstly, to judges of the High Court, not being members of the Court of Appeal. This use is not now frequent in England, though it is still regularly used of Colonial and Indian judges, not being Chief Justices. A *puisne mortgagee* is the other use, when it means a mortgagee second to the first original mortgagee, and postponed to him as far as his rights are concerned.

PULLEY. A small wheel turning on an axle, and usually with its circumference grooved to hold a rope. It is a form of simple machine, because it is a mechanical contrivance which will do work. There are two forms, the fixed pulley and the movable pulley.

Fixed Pulley. It is easier for a person to pull downward than upward. When pulling downward one may take advantage of a part or all one's weight, so if one wishes to lift a heavy weight, it is sometimes convenient to attach a rope to it, throw the rope over a beam, and pull downward. But the friction of the rope against the beam takes away very much, if not all, of the advantage thus gained. If the beam would turn as the rope passes over it, practically all friction would be avoided. This is exactly the principle of the fixed pulley—one whose axle is fastened to an immovable object. It merely changes the direction of a pull.

Movable Pulley. If the pulley is fastened to the object to be moved, a *mechanical advantage* may be gained, that is, the force needed to raise the object is less than its weight. In Fig. 3 the weight of the object w is supported half by the end of the rope a , and half by the end of the rope which is held in the hand. Therefore, any pull by the hand in excess of half the weights of the object and the pulley will lift the weight. The mechanical advantage in this case is said to be *two*, because the weight is twice the effort needed to hold it.



TYPES OF PULLEY

Fig. 1 A simple pulley. Fig. 2 A fixed pulley which merely changes the direction of the power. Fig. 3 A movable pulley which increases the effectiveness of the power.

Block and Tackle. This is a mechanical appliance which consists of a combination of pulleys and ropes. *Block* refers to the casing for the pulleys; *tackle* to the ropes. A single block contains one pulley; a double

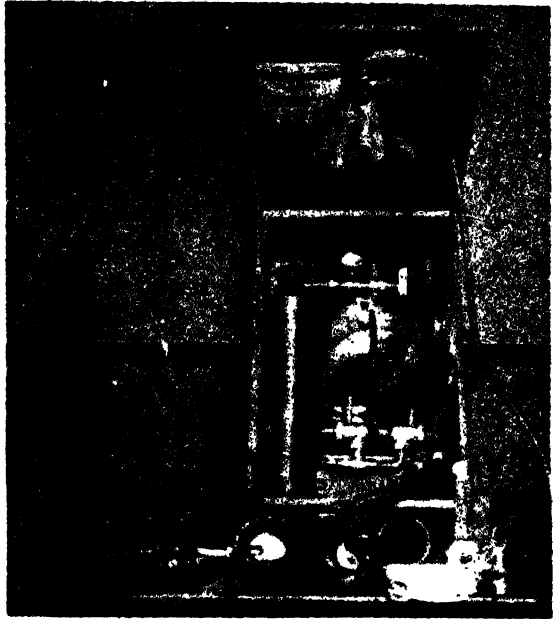
block, two pulleys, and so on. Each block usually has a hook with which to fasten it to its support or to the object to be moved.

In the previous section it is shown that a simple movable pulley, such as is contained in a single block and tackle, has a *mechanical advantage of two*; that is, with its help, a force will move practically twice the weight that it can move without it. The mechanical advantage of a double movable block is *four*: as shown below (c), there are four ropes, each of which bears one-fourth the weight; therefore, any pull on the end in excess of one-fourth the weight will lift the object. Similarly, the advantage of a triple movable block is *six*. It should be noted, however, that while the weight that can be lifted increases with the number of ropes, the distance through which the weight moves decreases in the same ratio.

Endless Chain. There is also the apparatus technically known as a differential pulley. It can be made to possess a very large mechanical advantage. The lower block is single, but the upper block has two pulleys of different sizes, fastened so that neither one can turn without the other. When the rope is pulled, it is wound on the larger pulley faster than it unwinds from the smaller. If the circumference of the larger pulley is 36 in. and that of the smaller is 32 in., when the wheels have been

tage in this case is thus seen to be *nine*, but it increases as the difference in the size of the pulleys decreases.

PULLMAN, GEORGE MORTIMER (1831-1897). An American inventor and capitalist,



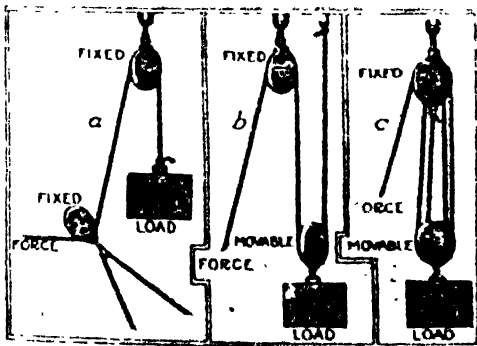
PULMOTOR

remembered chiefly for the railway sleeping car that bears his name. His first car was built in 1859.

PULMONARY CIRCULATION. See BLOOD, HEART.

PULMOTOR, *pul' mo tor*. A device for inducing artificial respiration, used in cases of electric shock, gas poisoning and drowning. It consists primarily of a tank of compressed oxygen connected with an injector, by means of which oxygen diluted with air is conveyed to the lungs of the patient.

PULPIT. The *pulpitum* (from which this word is derived) was the central part of a Greek or Latin stage, and the same name came to be applied to the Early Christian *ambo*, an elevated desk, which stood in the nave of the church, and was used as a place for reading or singing parts of the liturgy, and sometimes for the delivery of the sermon. In course of time the name of pulpit was reserved for this structure, now found in churches and kept for preaching only. Pulpits in English churches are thought to date from about the fourteenth century, and thence onwards they began to become a regular part of the furniture of a church. In the Royal Injunctions of 1547 and 1559



BLOCK AND TACKLE

(a) No mechanical advantage. (b) Mechanical advantage of two. (c) Mechanical advantage of four.

turned once the weight will have been raised the difference, or 4 in. Meanwhile, the hand pulling at the rope moves 36 in., nine times as far, and has exerted a force only one-ninth that of the weight. The mechanical advan-

the churchwardens were bidden to provide "a comely and honest pulpit to be set in a convenient place."

The place for the pulpit is in the nave, either in the north or south side of the middle aisle. Perhaps the most curious pulpit in the world is that at Cracow, which represents a ship complete with mast, sails and rigging, with figures of master mariners below.

PULQUE, *pool' kah*. An alcoholic drink, considered the national beverage of Mexico, Central America and South America. It is made by fermenting the juice of the agave, or century plant, for about ten days, and then mixing with it a small quantity of fresh juice. It is nutritious but extremely intoxicating.

PULSE, THE. A regular throbbing in the arteries, felt as a distinct beat in the radial artery at the wrist, or in the temporal artery, and occurring a fraction of a second after each heart beat. With each contraction of the heart, a wave of blood is poured into the aorta, the great artery which carries blood from the heart. The aorta is already filled with blood, and the wave forced into it by each contraction of the ventricle causes its walls to expand. Being elastic, they then contract, and force the blood into the arteries branching from the aorta, where the same process is repeated. Thus a series of expansions and contractions travels along the entire arterial system. The pulse is felt easily at the wrist and temples because the arteries there are near the surface. A pulse that is too strong or one that is too weak is of great significance in certain diseases. It suggests that the heart's action is more or less seriously interfered with. The pulse of a healthy adult beats on an average seventy-two times a minute. It is more rapid in children than in adults, and slower in old age than in middle life. In quite normal people, any excitation of the emotions or physical exertion causes a change in the pulse rate. See ARTERIES, BLOOD, HEART, VEINS.

PULTOWA, or POLTAVA, BATTLE OF. See CHARLES (XII, Sweden).

PUMA, *pu'ma*, OR **COUGAR**, *ku'gar*. A wild animal of the cat family, once found in the Americas from Canada to the southern part of South America. With advancing civilization, it has become extinct in large areas of its former range, but is still found in the Rockies, where it preys on sheep, calves, and other animals. *Cougar* is the native South American name.

The coat of the adult puma is tawny, the hairs being fawn-grey tipped with red. It has no spots, in this respect differing from the jaguar (which see); the throat, insides of the

legs, and the belly are white, and the tip of the tail black. A full-grown animal is four or five feet long, exclusive of the tail, which is about two feet in length. The body is slender, the legs long, and the head round and rather small.

Scientific Name. The puma belongs to the family *Felidae*. It is known as *Felis concolor*.

PUMICE, *pum'is*. A porous rock formed by the cooling and hardening of lava which contained dissolved gases. The pores in it were caused by the expansion of numerous bubbles of vapor. Pumice is so light that it floats on water—not because the rock substance is any lighter than other types of natural glass (obsidian), but because it contains so many closed air chambers. It is said that, after the explosion of the volcano of Krakatoa, sailors nearabout walked two miles upon floating pumice from their ships to shore.

PUMP. A mechanical device for moving liquids or gases. The suction or lift pump, the centrifugal pump, and the turbine pump, all depend upon different laws; the force pump is a suction pump with an additional feature.

The Lift Pump. This is the common well pump. Before Galileo's time, scholars thought that the suction of such a pump was due to nature's refusal to permit a vacuum, but Galileo, late in the sixteenth century, noticed that the pump would not raise water much more than 30 ft., and correctly attributed its working to the fact that air has weight. If in the pump illustrated overleaf, the cylinder and the pipe leading to it from below were emptied of air, there would be no pressure on the water under the mouth of the pipe. But air would still be exerting weight on the water around it, and since pressure on a liquid is transmitted through it in all directions, water would be pressed upward into the pipe. That the pump is so constructed as to take advantage of this law is shown in the illustration. The labour which the pumper performs merely lifts the water to the spout after nature has raised it to the intake valve.

The Force Pump. The intake valve of a suction pump can never be more than 33 ft. above the water in the cistern (see BAROMETR), and because of the imperfect valves of most pumps, this limit is reduced in practice to about 27 ft. But above the intake valve, the water is raised by the force exerted on the piston, so if the spout is turned upward the only limit to the height lies in this force.

The principle of the force pump is therefore the same as that of the lift pump, but another law of physics is commonly utilized to gain smoothness in operation. This is the law that compressed air always seeks to

expand. How this helps to give a constant flow is shown in the illustration below.

Centrifugal and Turbine Pumps. If a number of bottomless pails were whirled around inside a pipe, and there were only one hole where water could leave the pipe,

ment of the water plunger by means of a crank and connecting rod. A steam engine, an electric or petrol motor, or a water wheel may be used as the motive power. In the centrifugal type of pump, an impeller, which consists of a disk with ribs or vanes, performs

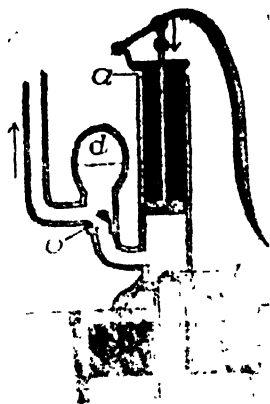


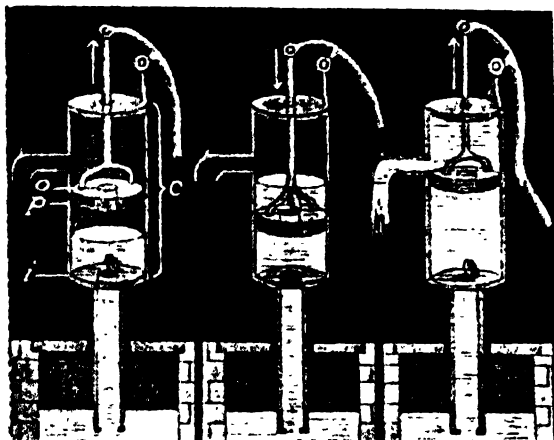
FIGURE 1

the water being driven up the outlet valve, and the cylinder being pushed up the air valve. The pump, by the cylinder being pushed up, is pushing out the water, and the air valve is pushing in the water, instead of being pushed through a valve in the piston, as in the first position. The air valve is pushed through an opening in the side, and not the outlet valve. The air done serves to maintain the flow between the pressure stroke. When the water is being forced through the outlet valve, it compresses the air in the dome, as soon as the water starts to withdraw, the outlet valve closes, and the compressed air expands, driving more water into the outlet pipe.

Each pail, as it passed this hole, would throw some of its water out and suck up more at the centre. This is exactly the action of a centrifugal pump, though, instead of pails, there are ordinarily four blades. This type of pump has the merit of giving constant flow, but it will not lift water very high.

The turbine pump is like a many-bladed screw propeller or an electric fan. Like the centrifugal pump, it produces a constant flow. In addition, it is free from valves, which in some classes of work would be liable to become clogged with sand or other small particles.

Power Pumps are of various types. The basic principle of their operation is the move-



THE LIFT PUMP

In the figure, *c* is the cylinder, *p*, the piston, *i*, the intake valve, *o*, the outlet valve. In the first position, the piston is being raised. The outlet valve is airtight, and all the air is being forced out through the spout. The pressure of the water raises the intake valve, and water takes the place of the air removed. In the second position, the piston is being lowered through the water which has entered. The pressure now opens the outlet valve and closes the intake valve, preventing the return of the water to the cistern below. In the last position, the water is being forced out as the air was in the first instance, and more water is entering.

PUMPKIN
Ptero Zepha

the function of a plunger. This type is used for pumping in connection with waterworks.

mines, deep wells, irrigation, dredging and sewage disposal. See AIR PUMP.

PUMPKIN. A coarse, creeping plant with hollow stalks, broad, prickly leaves, and large, orange-coloured, gourd-like fruit. In England it has been cultivated since the sixteenth century. The globe-shaped fruit, often 2 ft. in diameter, has tough, stringy pulp and large, white seeds. See illustration on previous page.

Scientific Name. The pumpkin belongs to the gourd family, *Cucurbitaceae*. Its botanical name is *Cucurbita pepo*.

PUN. A play upon words having the same or similar sounds, but different meanings. An example is the question and answer, "Is life worth living? That depends upon the liver." The pun was used both by Aristophanes and Cicero. In Tudor times and up till the time of Dr. Johnson, punning was an accepted literary practice; since that

time it has been less in favour, save with writers like Thomas Hood and Charles Lamb.

PUNCH AND JUDY

The two principal characters in a comic puppet show of Italian origin. The word *Punch* is a contraction of *Punchinello*. Punch and Judy shows were popular in England as early as the seventeenth century.



PUNCH AND JUDY SHOW
Photo Topical

PUNCH (Mechanical). An instrument for making holes through any type of material. A mechanical

punch may be used on anything from thin paper to steel many inches thick: the simplest form, for instance, is that used for making holes in paper for filing purposes.

The large mechanical punch for steelwork is generally operated hydraulically. It can punch through a number of sheets at the same time, or alternatively, may be of multiple design so that it can punch a large number of holes through the same sheet. The punch, which is usually combined with a shearing machine, must be absolutely rigid in action and must cut a clean hole.

PUNCTUATION. Signs used in writing to make clear the author's meaning. There are definite rules of punctuation which are modified in accordance with general usage.

The period (.) is used at the end of a declarative sentence and after all abbreviations. The point of interrogation (?) is used to mark a query, and should be placed after every sentence which is a direct question.

The point of exclamation (!) marks an emphatic utterance or an outcry, whether this is a full sentence or a few words.

The comma (,) is the most used of all the points, because it marks the slightest interruption in the thought or in the structure of a sentence.

The semicolon (;) is used to mark a break in thought or structure greater than that shown by the comma. Sometimes two clauses which really seem like distinct sentences are separated by a semicolon because the writer wishes to place emphasis upon the close connection of the thought. When a number of clauses which might otherwise be separated by commas contain commas, the semicolon is used for clearness.

The most common use of the colon (:) is to indicate that what follows it explains what precedes. In practice it is seldom used except in this introductory manner, to call attention to some quotation, or illustration.

The dash (—) is used to indicate a sudden break in sense, structure, or both. Often the phrase or clause which follows the dash is explanatory of what precedes.

Quotation marks are punctuation symbols used before and after certain quoted expressions. They are used singly or in pairs. Quotations within quotations are also marked: if the main quotation is marked by double inverted commas, the quotation within it is signified by single marks. The marks at the beginning of the quoted passage are inverted commas; those at the end are apostrophes, as—

Parentheses () are used to enclose words, phrases, or clauses inserted in a sentence to explain or to introduce some thought or suggestion that is really not essential to the course of the argument.

Figures or letters used to mark enumerations in a text are placed in parentheses.

An apostrophe (') is used to indicate the omission of letters or figures in contractions. The possessive case of nouns is formed by adding an apostrophe. The plurals of letters, figures, and certain artificial nouns are formed by the apostrophe and s.

PUNIC, pu'nik, WARS. Three struggles between Rome and Carthage. The name Punic was given by the Romans to the Carthaginians because of their Phoenician origin. The first of these wars lasted from 264 to 241 B.C., the second from 218 to 201 B.C., and the third from 149 to 146 B.C. The Romans were victorious in all three. In the first, they gained possession of a part of

Sicily; in the second, they won Spain; and in the third, they destroyed Carthage. See CARTHAGE; HANNIBAL; ROME.

PUNJAB, *pun jahb'*. A province of British

name from the five rivers, tributaries of the Indus, the Beas, Chenab, Jhelum, Ravi and Sutlej. In addition to the territory under direct British control there are thirty-four native states feudatory to the Government of India. These comprise an additional 45,000 square miles.

The climate presents greater extremes of heat and cold than any other part of India. In the cool season the days are warm and the nights cold. In the early part of the hot season the air is dry, but with the coming of the monsoon in June there is a slight temperature fall and a great increase in humidity. Thus part of the year is unhealthy. The autumn and spring crops depend on the monsoon and on the winter rains which fall in January. Wheat, barley, tobacco and vegetables are harvested in the spring and cotton, indigo, maize, millet, pulse, rice and sugar cane in the autumn. Manufactures are mostly native products. Lahore and Amritsar (the sacred city of the Sikhs)

are famous for carpets; silk fabrics are made at Multan and Bahawalpur and inland metal work at Gujrat.



AN HISTORIC SITE IN THE PUNJAB

Ruins of the city of Taxila, conquered and then fortified by Alexander the Great.

Courtesy: Indian Railways Bureau

India, with an area of 99,800 square miles and population (1931) 23,580,850. The capital is Lahore (429,747). The Punjab gets its



LAHORE

General view over the Fort.

Courtesy: Indian Railways Bureau

History. The Mogul Empire broke up in the eighteenth century. The Sikhs, who had just been raised into a nation, formed confederacies and, after some internecine strife, the Sikh states south of the Sutlej asked and were granted British protection. But before long the Sikhs from north of the Sutlej crossed the river and war followed, in which they were defeated. Eventually in 1849 the Punjab was annexed. A Governor, two members of Council and three Ministers now conduct the administration.

PUPA, pū' pa. The resting stage in the development of an insect, between the larval and the adult conditions. The appearance of the pupal stage varies for different species. In the less highly developed insect it is a featureless hard capsule, but in bees and ants the form of the adult is more evident and the legs and wings are free. In the pupal stage insects are unable to defend themselves actively against their enemies. Consequently various passive means of defence are adopted, such as a hard covering, or the silken cocoons that are spun by the caterpillars of butterflies and moths. As a general rule, also pupating larvae creep into some out-of-the-way spot such as the underside of a leaf, or a crevice in the bark of a tree or on a wall. Honey-bees pupate in brood cells of honey-comb.

Pupae appear to be quite dead, but all the time there is a gradual breaking down, stage by stage, of the larval structure and a rebuilding, inside and outside, into a completely new form. The energy for this transformation, or metamorphosis as it is called, is derived from the food supply which has been stored up by the caterpillars.

PUPIL. The black area in the iris of the eye (which see).

PURBECK, ISLE OF. See **DORSET**.

PURBECK MARBLE. An impure, freshwater limestone—composed chiefly of the shells of *Paludina*—which is found in the Isle of Purbeck, Dorsetshire. The so-called marble is used for fonts, plaques and internal decorative work.

PURCELL, HENRY (1658-1695). One of the foremost of English composers. He became a chorister in the Chapel Royal at an early age, and by the time he was 17 had produced his earliest masterpiece, the opera *Dido and Aeneas*, which has been spoken of as the one perfect English opera. He studied under Matthew Locke, an English composer of striking merit, but appears to have early formed some contempt for the English tradition and to have based his music consciously upon Italian models. At the age of 24 he published twelve sonatas of three parts, wherein he described himself as having "faithfully endeavoured a just

imitation of the most famed Italian masters." In thus turning his back on the still recent heritage of English polyphony, Purcell provides a counterpart to the drama played out half a century before in Italy, in the conflict between the old polyphonic tradition of Palestrina's school and the new monody of Monteverde and his fellow innovators. See **MUSIC; OPERA; VIOLS.**

Despite this objective, there is something, unmistakably English about Purcell's music. The art of flowing melody which he learnt at the Italian school was in his hands turned to far purer and fresher uses. A master of contrapuntal technique when counterpoint suited his purpose, Purcell was never at a loss to give brilliance of structure to his most useful works, but the most personal of his gifts was a genius for striking and original harmony.

Other major works include the music to Beaumont and Fletcher's

Diocletian (1690), a set of fantasies for violins in the old style (see **VIOLS**), including a masterpiece in five parts of which the tenor plays the one note C continuously throughout the piece, music to *The Temple* (1690); the musical drama *King Arthur* (1691), and a large number of Church compositions.

PURCHAS, SAMUEL (1572-1626). Compiler of three miscellaneous volumes of travel. *Purchas his Pilgrimage*, *Purchas his Pilgrimage*, and *Hakluytus Posthumus*. Much of the material for these works had been collected by Richard Hakluyt. It was while reading a passage in Purchas one day that Coleridge fell asleep, and woke to find the famous poem, *Kubla Khan*, already formed in his mind.

PURGATORY. According to the Catholic Church, the place or state of temporal punishment for the souls of those who have died guilty of venial (lesser) faults. They have not, by doing penance during life, made full satisfaction for their sins. Only after they have undergone this process of satisfaction and purgation are such souls admitted into heaven. Catholics further believe that these suffering souls can be assisted by the prayers of the living—who



HENRY PURCELL
(National Portrait)

may in certain cases apply for their benefit the indulgences (which see) which they have gained—and especially by the sacrifice of the Mass. Authority for the existence of purgatory is found in the Apocryphal books (see II Maccabees xii. 43-46). Evidence of the early Christian practice of praying for the dead, that they may be admitted into "the place of refreshment," is to be found in inscriptions in the Catacombs and in the writings of the early Fathers. One of the most important witnesses to early belief and practice on this point is St. Augustine (*De civitate Dei* xxi. 24).

PURIM. A Jewish secular feast in honour of the deliverance of the Jewish nation from the plots of Haman. See Esther ix. 26.

PURITANS. Puritanism is difficult to define owing to the divergences in belief and practice among those to whom the name "Puritan" was applied in the sixteenth and seventeenth centuries, because they claimed that their principles involved a purification of the existing worship and doctrine of the Church. Certain characteristics, however, were common to all to whom the name was applicable—a hatred of sacerdotalism, disbelief in episcopacy, dislike of any elaboration in the externals of worship, and extreme seriousness and strictness of life.

Puritanism had its first public manifestation in the so-called Vestarian Controversy in 1563, when those of the clergy who had embraced the Calvinism of Geneva opposed the use of the surplice in church. There were, however, deeper sources of cleavage within the Church than a dispute about vestments, and by the end of Elizabeth's reign there had come into being a large number of "Puritans" who, influenced by Calvin's doctrines, were antagonistic to Church teaching and polity. These were of two kinds. Some were Presbyterians who, whether of the moderate or stricter variety, held a strong view of the necessity of government by the larger Church, as opposed to the Congregational system (see PRESBYTERIAN CHURCH). Over against these were the others, Independents, who demanded individual freedom of worship and the congregational form of polity.

At the accession of James I, 750 Puritan clergymen presented the Millenary Petition, expressing their convictions. These were debated and set aside by the Hampton Court Conference. The turn of the Puritans, however, came later when, under the Long Parliament, Episcopacy was abolished, the form of worship according to the Prayer Book thrown over, and government by presbyteries in all parishes enforced by the State.

At the Restoration of Charles II the political power of Puritanism was broken, but its

principles have survived in varying degrees among the Nonconformist Protestant bodies. The Puritan spirit has been accused of an unlovely harshness, of a too fanatical hatred of art and of gaiety and, in general, of a dour estimate of life and of humanity. On the other hand, it fostered a passionate love of civic freedom, a pure morality, and deep individual piety. It produced two immortal works in Milton's *Paradise Lost* and Bunyan's *Pilgrim's Progress*, and is made memorable in the romantic story of the Pilgrim Fathers and the voyage of the *Mayflower* to America.

PURPLE. A secondary colour made by mixing red and blue pigments. Different shades are produced by varying the proportions of red and blue. Tyrian purple, which is a deep crimson, was the only purple known to the ancients. The dye was obtained from a shellfish found in the Mediterranean Sea, and called by the Romans *Purpura murex*, hence the name *purple*. Because dyeing of this kind was so costly, purple became the colour worn by royalty. The Roman Emperor wore a purple toga, the royal decrees of the Byzantine Empire are said to have been written with purple ink, and we still use the expression "the purple" to convey the idea of rank or authority.

The Romans discovered a process for making a purple dye from a variety of lichen, and kept the process secret for more than a century. Now purple dyes are made from coal-tar products.

PURPLE LOOSESTRIFE. A wild flower which grows freely in Britain, near ponds and streams and in meadows, bearing extensive clusters of red or purple flowers, it can be successfully cultivated in moist positions and is often grown in suspended pots. The variety *rosea*, bearing pink flowers tinged with purple, and that named *virgatum*, with purple flowers appearing in June, grow as much as 3 ft. high, and are frequently used in borders as hardy perennials.

Scientific Names. The common variety is *Lythrum salicaria*. The hyssop-leaved purple loosestrife is *L. hyssopifolia*. This is a smaller plant, with small purple flowers.

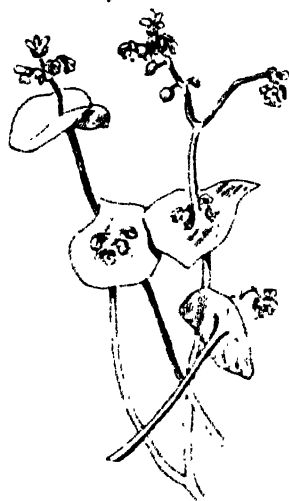
PURPURIN, fur' pur in. A dye obtained from madder root, now usually made synthetically. See DYEING AND DYE-STUFFS, Madder.

PURSER. In the mercantile marine, the Purser is the Accountant Officer of the ship. As such, he is responsible for all accounts and cash transactions in connection with ship, cargo, crew or passengers. In large liners, his responsibilities with regard to the passengers may be very arduous. He is in large part responsible for their general well-being and for the arrangement of their

amusements while on board; and he is required to prepare the often very detailed passenger manifests and other documents which may be called for by the authorities in the countries visited. Purssers are usually only carried in the larger vessels which convey passengers as well as freight.

In the Royal Navy, Purssers were borne from Stuart times onwards. They were the accountant officers, and were also responsible for the victualling of the ships' companies. During the nineteenth century their title was changed to "Paymaster and Purser." A little later "Purser" was dropped, and "Paymaster" added as a prefix to the titles of rank which were accorded as a consequence of the branch being divided into a number of grades; e.g. Fleet Paymaster, Assistant Paymaster. Shortly after the World War the existing titles were abolished, and the Accountant Officers were given the same titles as the executive branch, with the prefix "Paymaster"; e.g. Paymaster Commander.

PURSLANE. A hardy annual whose obovate fleshy leaves were at one time greatly



PURSLANE

used as a salad in Britain, now rarely grown. The leaves were also boiled in the same way as spinach. Young shoots are pickled by French peasants. Purslane can be easily raised from seed in rich light soil. The sea-purslane bears small white flowers growing from the forks of the stems. It is frequently found on the British coasts. The

varieties *grandiflora* and *Gilchristi* are cultivated for garden decorative purposes.

Scientific Name. Purslane is known as *Portulaca oleracea*; sea-purslane is *Arenaria peploides*.

PURSUIVANT, *per se vent*. See HERALDRY.

PUS. A thick yellow fluid produced by inflammation or by an abscess, or by a septic wound. Pus corpuscles, which are derived from white blood-cells, arise from suppuration, a process of the decay of tissues. Pus reveals infection with bacteria and should be removed from wounds and ulcers with antiseptics.

PUSEY, EDWARD BOUVERIE (1800-1882). An Anglican scholar and divine, the best known and most important leader, after Newman, of the Oxford Movement (which see). Pusey was educated at Eton and Christ Church, Oxford, where he matriculated in 1819. After a distinguished undergraduate career, resulting in his election to a fellowship at Oriel in 1823, he went to Germany to study theology and languages. From there he came back filled with a strong aversion from the German rationalism of the day. This aversion made him the more ready to sympathize with the Tractarians whom he formally joined in 1835, writing some of the *Tracts for the Times* and adding to the movement the great weight of his long position in the University as Canon of Christ Church and Regius Professor of Hebrew, and his immensely respected personal character.

EDWARD PUSEY
(National Portrait Gallery)

For a time matters went well, but the famous Tracts written by Newman provoked a storm, which broke upon the heads of the leaders of the movement with extraordinary violence. Of this Pusey bore a large share. In 1843 he was suspended by the University authorities from preaching, many of his friends fell away from him, and he was viewed with hostility by the bishops, and with suspicion and dislike by all those who accused the movement of being an underhand scheme to throw the English Church into the arms of Rome.

Pusey's position was further weakened in 1845 by the crushing blow of Newman's secession, followed by many others, to Rome. But he remained firm, though the Tractarian party seemed at the moment to be shattered, and continued to inspire and lead the remnant. And it was his stability and authority that chiefly kept it together, and paved the way for its growth and future influence upon the Church.

His life almost up to the end was a series of continual battles for the Tractarian principles, and against the Erastianism that prevailed; but, though he passed it in an arena of conflict, his personal life was one of great austerity, saintliness and chastity, and since the rest of the old controversies has died

down, he is generally acknowledged to be one of the great figures of the Anglican Church.

PUSHKIN, *poosh' kin*, ALEXANDER (1799-1837). A Russian author of aristocratic birth. Before his education in St. Petersburg (now Leningrad) was finished, his ability as a poet had been recognized. In 1820 he published *Ruslan and Ludmila*, the first great Russian poem since the early epics.

After a few years, Pushkin's revolutionary verses brought about his exile, first to Bessarabia, then to his estates in the interior of Russia. In these years of exile his best work was done.

From exile, Pushkin was recalled to court, where he became an official. During the years 1826 to 1837 he published a considerable amount of work, including the novel in verse, *Eugene Onegin*, in which Russian scenes and people were depicted with realism for the first time in modern Russian literature. During this period also, Pushkin married, none too happily; and in 1837 he was killed in a duel.

Pushkin was a master of prose as well as verse. One of his most popular short stories, *The Queen of Spades*, was used by Tschaiovsky for an opera. A dramatic chronicle, *Boris Godunov*, is well known through the opera based upon it by Mussorgsky. This was the first Russian drama in the Shakespearean style, before Pushkin, the stage had been under French influence. To Pushkin the Russians owe the change from an artificial style to the rich and expressive native Russian.

PUTREFACTION. Decomposition which takes place in dead tissues of plants and animals under the influence of bacteria, everywhere present in the lower air, in water, and on the earth (see BACTERIA and BACTERIOLOGY). When the decomposing substances are proteins, ptomaines and ill-smelling gases are generally produced, thus, sulphuretted hydrogen is the characteristic poisonous and bad-smelling gas of rotten eggs. Putrefaction is aided by warmth, moisture, and exposure to the air, but very high and very low temperatures interfere with its progress. In cold temperatures the germs multiply slowly, in very high temperatures many of the germs are killed.

PUTRID SEA. See AZOV, SEA OF.

PUTTING THE SHOT. See SHOT.

PUTTY. A cement made of whiting (fine chalk) and boiled linseed oil, used to fill cavities in wood finishing, and to fasten window panes in sashes. For inside work, white lead is often added, together with a little tallow to keep the mixture from becoming too hard.

PU YI, EMPEROR OF MANCHUKUO (born 1905). Pu Yi succeeded his uncle, Kuang Hsu, as Emperor of China in 1908. The death of the Empress Dowager—"the Old Buddha"—for nearly fifty years the real ruler of China, was followed by attempts at constitutional reform, but revolution came in 1911. China was declared a Republic, the Empire, however, was not abolished and the child Emperor continued to live in the Forbidden City of Peking. In 1919 Reginald Johnston became his tutor. The Emperor's throne name was Hsuan Tung; for use by his tutor and familiar friends he now adopted the name of Henry. This name was merely an alternative for private use, and such expressions as "Henry Pu-Yi" or "Mr Pu-Yi" are as incorrect as they are common.

In 1929 the Emperor's life was in danger from the Christian General, Feng Yu Hsiang, whose armies had seized Peking. His tutor successfully conveyed him and his young Empress to the safety of the British Legation. The Chinese Republican authorities, disregarding pledges given in 1911, began to denounce the Imperial office and seize the Emperor's property, and in 1931 he retired to Dairen, in Manchuria. A year later, Japanese bayonets established the Republic of Manchukuo, with Pu Yi as its Chih Cheng or Administrator. In 1934 he was declared Emperor of Manchukuo, a title which was his by right, since his ancestors had been the Manchu Emperors who conquered China. He assumed the throne name of Kang Teh.

It is generally assumed in Europe that he can be nothing more than a puppet king, controlled by Japan. The accuracy of this assumption must be tested by events.

PWLLHELL, *pool hel' e*. A Municipal Borough and seaport of Caernarvonshire, with an area of 1120 acres and a population in 1931 of 3599. It is the chief town of the remote peninsula of Lley, having rail connection with Tremadoc and thence to the main lines at Bangor and Aberdovey. Situated at the head of its small landlocked harbour, the Old Town has for long been a centre of the fishing industry, which, however, is limited in its scope by the shoals and dangerous currents of Cardigan Bay. Pwllhell's modern development has come mainly on the lines of a watering-place.

PYAEMIA, *pi e' mia*. See SEPTICÆMIA.

PYGMALION, *pig may' leon*. A mythical Grecian sculptor, who gave to his art all the love which he should have given to a woman. As a punishment, Aphrodite decreed that he should fall in love with a statue which he had carved. In response to his prayers, Aphrodite endowed the statue with life; and some writers give her name as Galatea.

PYGMIES, *pig' miz*. A name applied to those peoples who are far below normal in stature and who exhibit this peculiarity as a racial characteristic, not as an individual defect. The men of such races are, on an average, less than 5 ft. tall. In general, pygmies may be divided into two groups—the African, or Negrillos, and the Asiatic, or Negritos. The Asiatic are found chiefly in the Malay Peninsula and in the Philippine and Andaman Islands; the African



PYGMIES OF EAST AFRICA
Photo House and McGeorge, Nairobi

in a region on that continent extending about 200 miles north and south of the equator. Negrito tribes have also been discovered in New Guinea. All pygmies of unmixed blood, whether Asiatic or African, have certain pronounced characteristics. These include, besides their short stature, closely curling hair, flattened nose, large mouth, receding chin, an abundance of woolly hair on the body, and arms long in proportion to the legs. The skin of Negrillos is dark-brown or black, while the Negritos are of a reddish-yellow or chocolate-brown colour. The Negrillos have very prominent abdomens.

Pygmies have the customs and habits of a primitive people. They wear little clothing, live in huts made of branches and foliage, and obtain their food by hunting and fishing.

Derivation of Term. The name *pygmy*, from the Greek word for a measure of length corresponding to the distance between the elbow and the knuckles, was first used by Homer in the *Iliad*. He applied it to a

race of dwarfs described as living in a region far to the south.

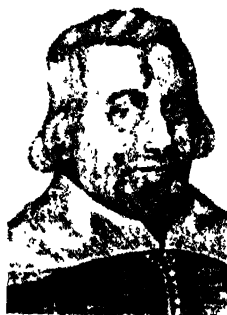
PYLADES, *pi' ah deez*. See **ORESTES**.

PYLON, *pi' lon*. Entrance to a temple or an ornamental gate of monumental proportions, flanked on both sides by a pyramidal tower. It is now applied to a tower from which aeroplanes may be launched, or to the latticed steel towers erected under the "Grid" system of electricity supply and distribution in England to carry the electricity cables.

PYLORUS, *pi lor' us*. A circular fold of mucous membrane, forming a gate at the opening from the stomach into the intestine. See **ALIMENTARY CANAL**.

PYM, JOHN (1584-1643). Pym, a member of an ancient Somerset family, came down from Oxford in 1602 to study law. He represented Calne in 1614 and again in 1621, when he declared that toleration for Catholics would lead inevitably to "extirpation of all contrary religions." He also helped to draw up the "Protestation" of Parliamentary liberties; this was torn from the Commons' Journal by James I's own hand. When the House had risen, he was for some time under arrest. He sat for Bedford in the uneventful Parliament of 1624. The first Parliament of Charles I took the unprecedented step of granting Tonnage and Poundage for one year only. The Parliament of 1626 impeached Buckingham. In this Pym was an active mover. In the third Parliament he supported the "Petition of Right," to which Charles gave his consent. In making the claim that the right of taxation depended on Parliamentary consent, Pym was probably unconscious of taking a revolutionary step. He thought of himself rather as conservative, restoring the old law of England as it had been before the Stuarts or Tudors came to the throne.

In the Short Parliament of 1640 he headed the demand that grievances should be considered before the subsidies urgently needed for the Scots War. When the Peers expressed the opposite opinion, he claimed that this was a breach of the Commons' privilege to deal with money bills. A quarrel between



JOHN PYM

This "true Effigies of Mr. John Pym Esquire" was printed in 1641 with the speech he delivered in Parliament after his discharge from the accusation of high treason. (National Portrait Gallery)

the Houses would have been the King's opportunity, but a majority of the Privy Council persuaded Charles to dissolve Parliament. Political grievances might have been forgotten in hatred of the Scots, if the war had not been over religion. To Pym and his followers, Anglicans like Charles and Laud appeared as Papists thinly disguised.

When the Long Parliament of 1642 was summoned, Pym's attack forestalled Strafford. Pym's contention was ingenious—that the cumulative effect of Strafford's acts was treasonous, although treason could not be proved in detail—but clever attack was met by clever defence, and an Act of Attainder had to be secured on the charge that the Irish army was intended to overawe England. Pym's authority was now so great that the Royalists called him "King" Pym. Prerogative Courts, Ship Money and other unpopular methods of raising money for the Crown were abolished; and Parliament was declared dissoluble only by its own consent. Pym's majority in the Commons almost vanished, however, when he introduced the Grand Remonstrance, a wordy indictment of Charles, including an attack on the episcopacy.

Charles, watching events closely, decided to arrest Pym on a charge of treasonable correspondence with the Scots. Pym and four other members escaped, later to return in triumph, and war soon followed. Pym used his great gifts of organization and stimulated recruiting. His last public act of importance was to arrange the "Solemn League and Covenant," which secured for the Parliament the help of the Scots army.

Pym was one of the first great Parliamentarians, with a remarkable power over the Commons. He was personally popular, for his Puritanism had not soured his kindness. His honesty was unquestioned, and if he demanded for Parliament powers which would then have proved disastrous for the nation, he made them in good faith as a matter of right. That the broad statesmanship of his early career tended to narrow into adroit political manoeuvre was the natural result of the increasing bitterness of the parties.

PYORRHOEA, *pi* or *re'* a. A disease of the gums and bony structure surrounding the teeth. Early indications of pyorrhoea are redness and flabbiness of the gums, starting at the "gum line," with tendency to bleeding. The gums recede from the teeth, and pus, which forms in the crevices, may be seen exuding from around the roots and in the spaces between the teeth. Continued inflammation of the gums and bony structure causes the teeth to loosen and fall out,

but even more serious than this effect is the spread of pus and bacteria through the body. Joint rheumatism (arthritis), heart trouble, indigestion, and other ailments often can be traced to cases of pyorrhoea.

The trouble arises from infection of the membrane that lines the sockets in which the teeth lie. This membrane becomes diseased through injuries from unequal pressure of crooked teeth and poor dental work; through deposits of fermenting food particles; and through irritation from tartar or scale. Pyorrhoea is curable in the early stages. Treatment consists in removal of tartar, antiseptic cleansing of the gums, and hypodermic injection of emetine into the root canal. See DENTISTRY.

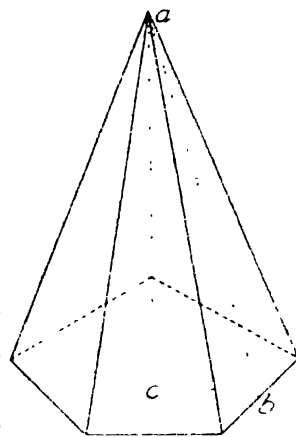
PYRAMID. A solid whose base is a triangle or polygon, and whose faces are triangles, all of which meet at a common point.

When the base is a square, an equilateral triangle, or a regular pentagon, and the faces are equal isosceles triangles, the pyramid is called a *regular pyramid*. The point where the faces meet (*a* in Fig. 1) is called the *vertex*. The perpendicular distance from the vertex to the base (*a c* in Fig. 1) is the *altitude* of the pyramid.

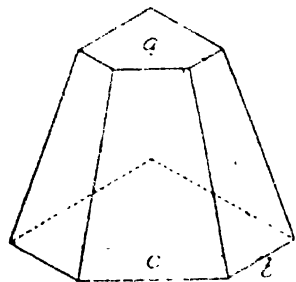
The distance from the vertex to the middle point of any side of the base is the *slant height* (*a b* in Fig. 1).

Since each face is a triangle, its area is the product of one side of the base and one-half of the slant height. (The *slant height* is the altitude of each triangular face.)

The area of the entire lateral surface of a pyramid is the product of the perimeter of the base and one-half the slant height. The volume of a pyramid is one-third of



Explanation appears in the text



Compare Fig. 1 for explanation of the symbols.

the volume of a prism of the same base and height, or The volume of a pyramid is the area of the base multiplied by one-third the altitude. The formula is:

$$\text{Volume of pyramid} = \text{area of base} \times \frac{\text{altitude}}{3}$$

Frustum. The part of a pyramid between the base and a plane which cuts the pyramid parallel to the base.

LATERAL AREA. Its lateral area is made up of trapezoids whose lower edges make the perimeter of the lower base of the frustum, and whose upper edges make the perimeter of the upper base of the frustum. *To find the area of the lateral surface of a frustum, multiply one-half the sum of the perimeters of the bases by the slant height. See TRAPEZIUM.*

VOLUME. *To find the volume of a frustum, multiply the sum of the areas of the two bases and the square root of their product by one-third of the distance between the bases.*

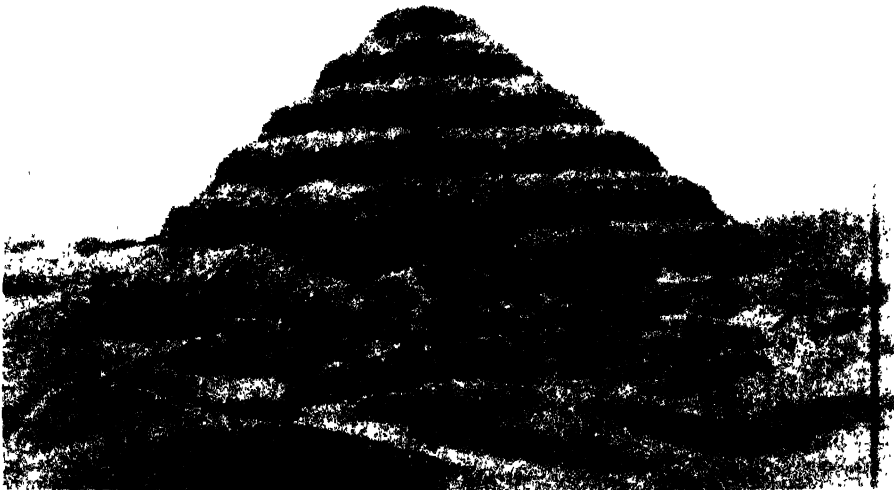
PYRAMIDS. The royal tombs of ancient Egypt, belonging to the Old Kingdom period. The most famous—a group of three near Giza—were numbered among the Seven Wonders of the Ancient World.

The celebrated Giza pyramids are situated about 5 miles west of Cairo, on the border of the Libyan Desert. The largest of these, the Great Pyramid, was erected by Khufu, whom the Greeks called Cheops. He was the second king of the fourth dynasty, and lived, probably, twenty-nine centuries before the Christian Era. Herodotus, the Greek historian, is authority for the statement that it took 100,000 men twenty years

to erect the Great Pyramid. Its base covers 13 acres, and its triangular sides rise, at the present time, to an apex 450 ft. (perpendicularly) above the ground; the original height was 481 ft. One Egyptologist has estimated that this massive structure—the largest piece of masonry ever built—contains 2,300,000 stone blocks, which have an average size of 40 cubic feet. Ages ago this pyramid had an outer casing made of polished stones, all carefully fitted together, but this has long since been stripped off, leaving exposed the central core of rough-hewn blocks.

The entrance of the Great Pyramid is in the north side of the structure, about 49 ft. above the ground. From it a sloping passage descends gradually to a horizontal corridor which opens into an underground chamber. From the sloping passage another, ascending, passage leads to the so-called Queen's Chamber and to the Great Hall. The latter, a high, narrow vault, terminates in another passage which leads to the main burial chamber known as the King's Chamber. This is lined with polished granite and contains a monolithic granite sarcophagus.

The Second and Third Pyramids of the Giza group are also massive structures, their perpendicular heights being now 447½ ft. and 204 ft., respectively. The Second Pyramid was built by Chephren, the successor of Cheops, and the Third by Mycerinus, the successor of Chephren. There are three small pyramids east of the Great Pyramid, erected for the wives of Cheops. There are in



PYRAMID AT BAKKARA, NEAR CAIRO

Photo: P. & A.





RUINS OF THE GRANITE TEMPLE, THE SPHINX, AND THE GREAT PYRAMID, NEAR CAIRO
Photo: U. & U.

existence about seventy-five Egyptian pyramids, arranged in groups that extend in a north-and-south direction from Abu Roâsh to Medum, on the west side of the Nile.

PYRAMIDS, BATTLE OF THE. See NAPOLEON I.

PYRAMUS AND THISBE, *pir' ra mus, thiz' be*. In ancient folklore, two unfortunate lovers whose home was in Babylon. They lived in adjoining houses, but their parents were so averse to the idea of their marriage that they were not allowed to see each other. Finally, they planned to meet by moonlight beneath a certain mulberry tree outside the city. Thisbe arrived first, but was frightened by a lion and fled, dropping her veil, which the lion caught and tore with his bloody mouth. When Pyramus reached the spot, some time later, he saw the lion and the bloodstained veil, and, fancying that Thisbe had been killed, stabbed himself with his dagger. Thisbe, finding his dead body, seized the dagger and plunged it into her own bosom. The fruit of the mulberry tree, which had up to that time been white, changed to blood-red. The story is told by the poet Ovid and in burlesque by Shakespeare.

PYRENEAN MOUNTAIN DOG. Somewhat resembling the great St. Bernard in outline, the Pyrenean mountain dog is of a lighter and somewhat more active build, though probably of no less height. The thick, woolly white coat has slight markings of brindle or lemon.

There are comparatively few specimens in England at the present time, but these dogs have much to recommend them, being attractive companions, excellent guards, and very obedient. It is to be expected that their popularity will grow.

PYRENEES, *pir' renez*. A mountain chain between France and Spain. The Pyrenees extend from east to west for a distance of 280 miles, and cover an area of over 20,000 square miles. Their average height is only about 3500 ft., but in the central ranges there are several peaks over 10,000 ft. in altitude. In this section the culminating point of the mountains is reached in the Pic d'Aneto, which is 11,346 ft. above the sea. Minerals are not found in these mountains in quantities to make the region noteworthy as an economic asset; they are chiefly copper, iron, lead, silver, and cobalt.

The passes across the mountains are of great elevation and they are few in number. The Col de la Perche and the Col de Somport are two which take most of the motor traffic; owing to the difficulties of transport, trade between France and Spain is carried on chiefly by sea. On the northern slopes of

the mountains there are several well-known watering places; on the southern slope of the Eastern Pyrenees is Andorra, one of the smallest republics in the world. See ANDORRA.

A feature occurring frequently in the Pyrenees and found but rarely in the Alps or other ranges are the almost circular chasms or *cirques*, formed where valleys run up into the mountains and end abruptly against the main range. The most famous of these is the Cirque de Gavarnie on the French side beneath the Mont Perdu (11,170 ft.). The Pyrenees contain few glaciers and these are small and do not descend into the valleys.

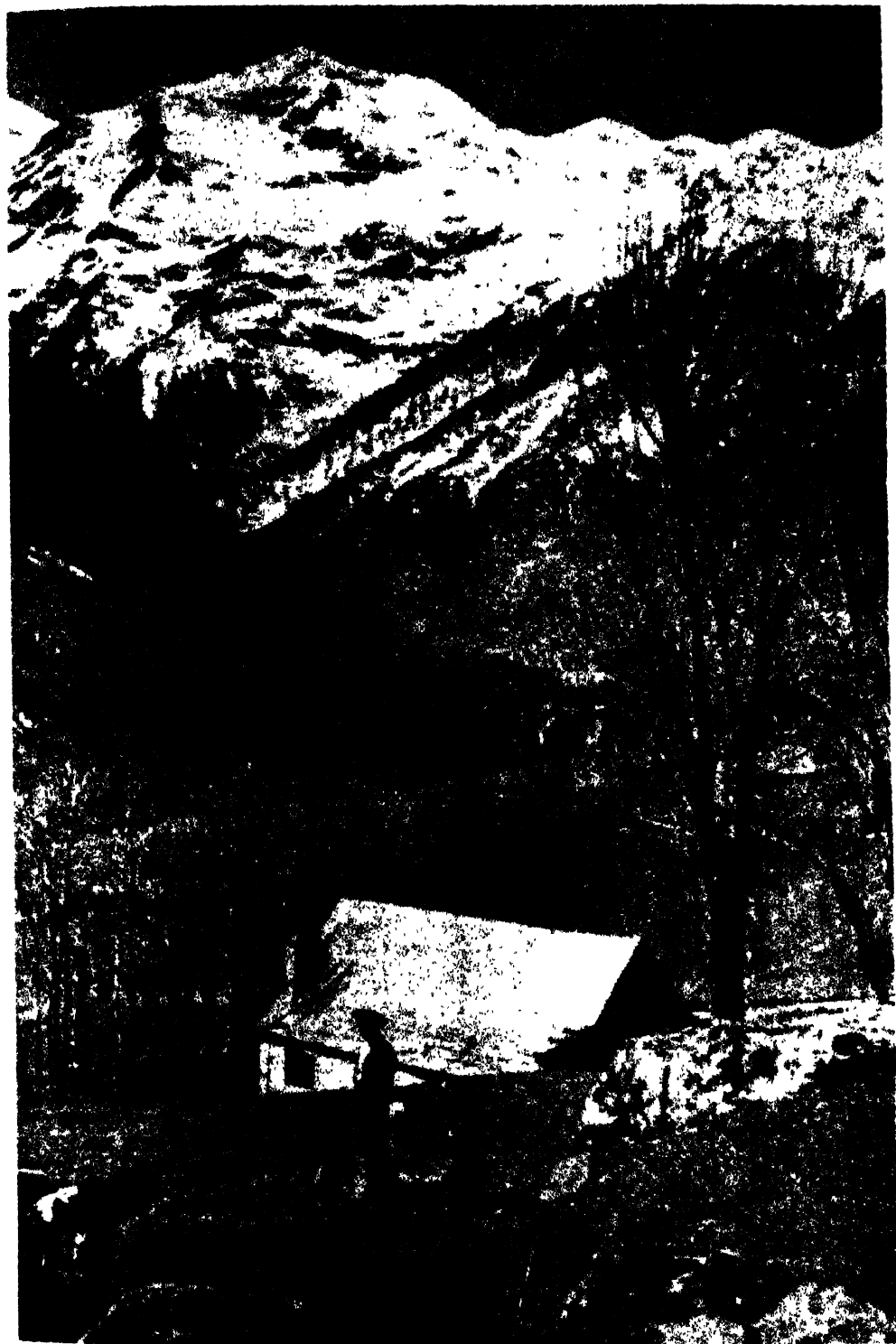
Traffic between France and Spain has been greatly facilitated by the opening of two trans-Pyrenean railways, which were begun before the War. The first, opened in 1928, runs from Pau to Saragossa via the Canfranc tunnel; the second, an electrified line opened in July, 1929, unites Toulouse and Barcelona, and shortens the rail journey from Paris to Barcelona by several hours.

PYRETHRUM, *pī re' thrum* or *pī reth' rum*. A popular garden plant which is botanically



PYRETHRUM
Photo: Sutton & Sons

classified under *Chrysanthemums*. Nearly all varieties flower in May and June. Both single and double kinds are popular for



WINTER IN THE VALLE DU LYS, FRENCH PYRENEES

table decoration, the colours varying from pure white to all shades of crimson and rose. The flowers surmount tall erect stalks, some being perfect double blooms and others with guard florets; leaves are normally feather-shaped. Pyrethrums can be increased by seed or by division. The giant feverfew often attains a height of 6 ft. *P. roseum* (*Chrysanthemum coccineum*) thrives in deep rich loam, and bears white, purple, and red flowers. *P. aureum* is another favourite perennial. Of other varieties there is an immense number.

PYRIDINE, *pir' ri din*. See COAL TAR.

PYRITES, *pi' ri' teez*. A compound of iron and sulphur found either in crystals or in veins in rocks. It often occurs in small quantities



IRON PYRITES
Photo: H. E. Taylor

with coal, and it tends to form a thin yellow coating along the line of division. In appearance it much resembles unrefined gold. It is used extensively in the manufacture of sulphuric acid (which see).

Copper pyrites, which is a compound of copper and sulphur, is of a darker yellow than iron pyrites, and may be smelted for the copper. It sometimes contains small quantities of gold and silver. It may be distinguished from iron pyrites by the fact that it can be scratched with a knife blade.

Chemical Formula. The formula for iron pyrites is FeS_2 ; that is, a molecule contains one atom of iron and two atoms of sulphur.

PYROLUSITE, *pi ro lu' site*. Black oxide of manganese, occurring in large deposits in India, Russia and Brazil, the chief source of the metal. See MANGANESE.

PYROMETRY, *pi rom' et ri*. The measuring of the expansion of bodies by heat: specifically, through the use of a pyrometer, or instrument designed for the purpose. It implies the measurement of temperatures beyond the range of the mercurial thermometer, usually by measuring radiations.

PYROPE, *pi' rope*. See GARNET.

PYROTECHNICS. Fireworks used for display purposes may be divided into two groups, aerial and ground. The former group includes those which travel into the air, such as bombshells, rockets and tourbillons, and those which, although they remain on the ground, produce aerial effects, as the Roman candle.

The *bombshell* is a globe composed of layers of paper and filled with stars (small cylinders of composition burning with varying colour or other effects) and an opening charge of gunpowder. It is fired into the air from a mortar of steel or other suitable material by the explosion of a small quantity of gunpowder. The quickmatch "lighter" which ignites the lifting charge also fires a time fuse, which ensures that the shell explodes when it reaches the highest point of its flight.

The *rocket* is propelled by recoil produced by the rapid combustion of the composition contained in a rolled paper cylinder. To increase the reaction, the open end of the cylinder is constructed "choked," and a conical cavity is left in the centre of the composition, so that a large surface of composition becomes ignited. Display rockets are fitted with a cap to contain the "garniture" or stars, which become ignited and are blown from the cap when the composition burns through above the cavity. In displays, rockets are usually discharged in "flights," being connected together by quickmatch to ensure simultaneous ignition.

Tourbillons are cylindrical cases charged with a mixture similar to that used for rockets and closed at either end. A slightly curved piece of wood is fixed half-way along the case to act as a pivot, and two holes are bored near either end at right angles to the axis. When ignited on a smooth surface, the tourbillion spins rapidly for a few seconds, when the fire rushing from the additional holes in a downward direction drives it into the air.

Roman candles are fired in batteries of five or six cases arranged fan-wise. Each case throws up a series of stars at short intervals. The effect produced by a series of batteries so arranged that the stars cross one another in their flight is very spectacular.

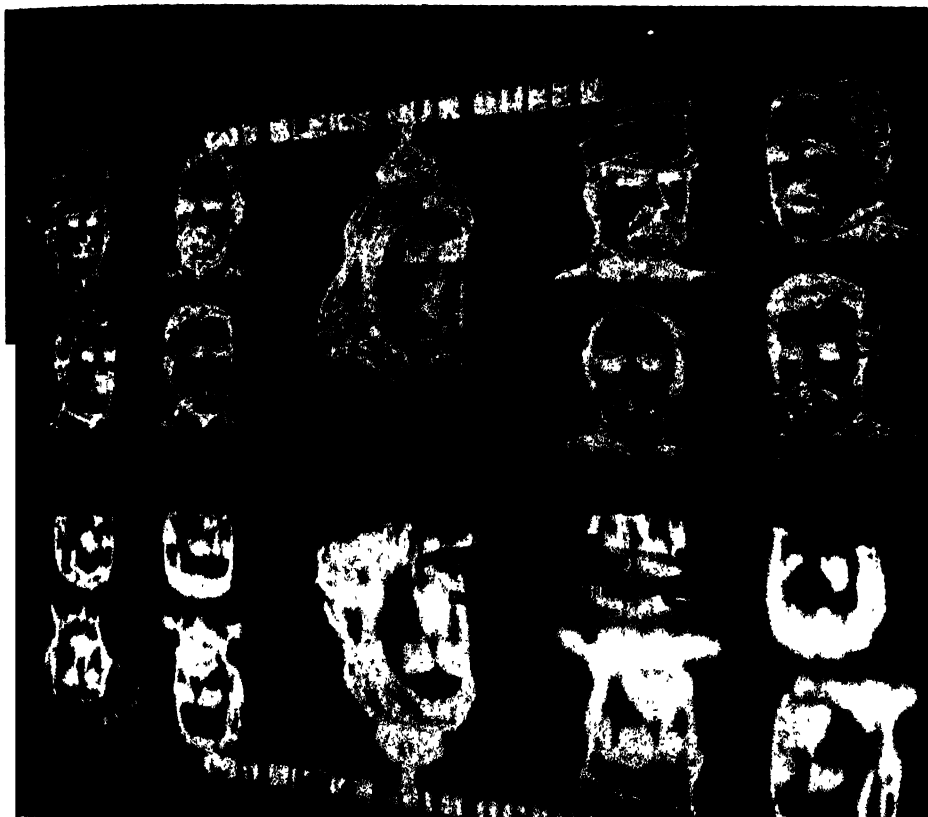
Ground fireworks for displays are generally "devices" or "set pieces" of various kinds consisting of a number of firework units attached to a framework of wood. The units most frequently used for the purpose are "gerbes," cases throwing out fountains of golden fire, and fixed cases, producing a rather less showy jet and ending with a bang or "bounce." The introduction of aluminium powder into his material has

enabled the pyrotechnist to produce similar effects in brilliant white fire.

A favourite device is some form of wheel set in motion by the reaction of the fire from gerbes or "turning cases." Wheels revolving both vertically and horizontally are used; the framework is embellished with

lances, which burn with flames of various colours, are about the size of a cigarette and are attached by means of double-pointed nails to the wood or cane outline of the design; they are lighted simultaneously by quickmatch.

Of the ingredients used in the manufacture



"TABLEAU" IN A FAMOUS FIRE PORTRAIT

This set piece was eighty feet high and two hundred in length. It was produced to celebrate the end of the South African War.

Photo Brock

coloured lights and sometimes smaller wheels.

Another type of device is that which produces a geometrical design carried out in jets of fire from gerbe and similar cases. coloured lights and wheels are often worked into the design.

A cascade or waterfall, produced by a horizontal line of gold or white jets playing downwards and slightly forward, is a very popular device.

Set-pieces are pictorial designs carried out in fire, the design being outlined by numbers of small fireworks known as "lances." The

of fireworks the first and still one of the most important is Potassium nitrate or saltpetre, the main constituent of gunpowder. The other components of gunpowder—sulphur and charcoal—are also largely used, particularly in mixtures to produce force, as in rockets and tourbillons, and also for fountain and spark fireworks, to which filings of iron or steel are added.

Potassium chlorate appears in almost all colour mixtures, colour being supplied by the presence of metal salts, those of strontium producing red, barium green, sodium yellow, and copper blue.



A BIG DISPLAY OF ROMAN CANDLES

Photo: Brock

PYROXENE, *pī'rok seen*. The name applied to a group of silicate minerals, occurring in crystals in limestones, dolomite, gneisses, and some other rocks. Their colours range from pure white to green, brown, and black, depending chiefly upon the abundance and condition of the iron in them. *Diopside*, sometimes polished and used for ornamental purposes, is colourless or pale green, *salite* is a dark-green variety, *aegite*, dark-green or black, is the common pyroxene of igneous rocks.

Chemical Formula. The simplified formula for the pyroxenes is $\text{CaMgSi}_2\text{O}_6$, representing one atom of calcium, one of magnesium, two of silicon, and six of oxygen.

PYROXYLIN, *pī'rok' sil in*. See CELLULOID; CELLULOSE.

PYRRHA, *pī'r'a*. See DEUCALION.

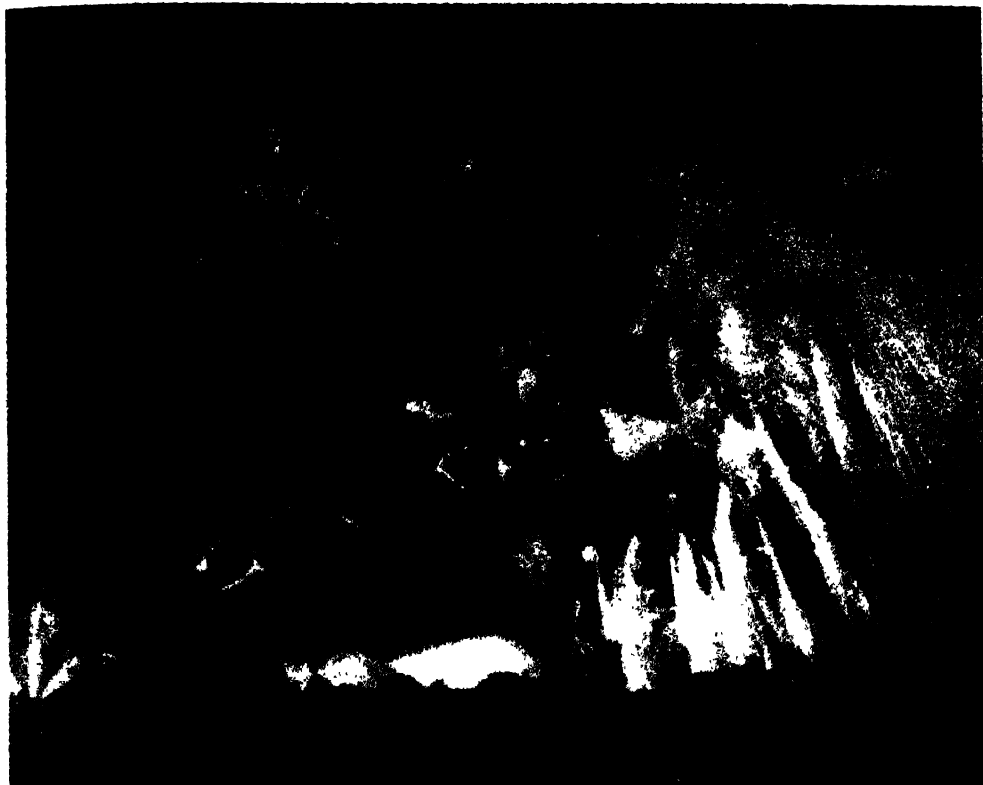
PYRRHUS, *pī'r'rus* (about 318-272 B.C.). A Greek military leader of the classical period. During his youth he recovered the throne of Epirus, which his father had lost, but Pyrrhus himself was deposed by his people in 302 B.C., and forced to take refuge in Egypt. After marrying the step-daughter of Ptolemy Soter, Pyrrhus returned to his native country, recovered the throne, and

undertook the conquest of Macedonia, with success.

The Tarentines (a Greek colony of south Italy) and their neighbours appealed to Pyrrhus in 281 B.C. for aid against the Romans and allies. Pyrrhus hastened to their assistance with 25,000 men and twenty elephants, the Romans were defeated, chiefly because of the large part the elephants played in the battle. In 279 B.C. Pyrrhus won the Battle of Ausculum, achieving the famous "Pyrrhic victory", although defeating his foe, such were his losses that he remarked, "Another such victory and I shall return home alone."

Later, he assisted the Greeks of Sicily against the Carthaginians, at first successfully, but owing to lack of support from Greece and an alliance between the Carthaginians and Romans, he was defeated in 274 B.C. During the last three years of his life, he renewed his invasions of Macedonia, led an army into the Peloponnesus, and unsuccessfully attacked Sparta. At Argos he met Antigonus of Macedon in a pitched battle, and was killed.

PYTHAGORAS. Founder of an important philosophical, ethical, and scientific school



AERIAL FIREWORKS AT THE CRYSTAL PALACE

This display was given during the visit of H.I.M. the Shah of Persia, in August, 1902

Photo Brock



WATERFALL OF FIRE

This set piece is produced by a horizontal line of white jets playing downwards and slightly forwards

Photo: Brock



PYTHON AFTER SHEDDING ITS SKIN
The old skin is on the right of the illustration.

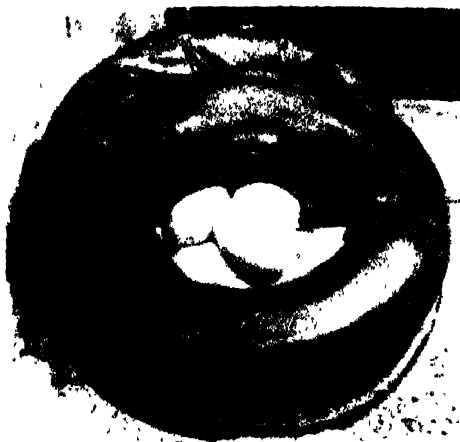
Photo: Cherry Kearton

in the sixth century B.C. Born at Samos, c. 582 B.C., he is said to have travelled extensively. He and his followers adopted an ascetic form of life, abstaining from fish and meat and always walking barefooted. He established his society at Croaton, where he preached the doctrine of the transmigration of souls and the value of abstinence. Pythagoras, who is sometimes described as the father of science, is credited with having discovered the spherical shape of the earth. His best-known contribution to mathematics is his theorem that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.

PYTHIAN, *pyth'ian*, GAMES. A national festival of the ancient Greeks, celebrated in honour of Apollo at Delphi, near the shrine and oracle of the god. The name had reference to the dragon Python, the slaughter of which was accomplished by Apollo five days after his birth. The games were the second of four great national festivals, the others being the Olympian, the Nemean, and the Isthmian. At first the Pythian games were celebrated every ninth year, and consisted merely of a contest between singers, but a new series was inaugurated about 586 B.C. Thereafter, the celebration occurred every four years until about A.D. 300. Athletic contests and horse-racing were added, and eventually, dramatists, histor-

ians, poets, and artists competed for honours. The prizes were the laurel wreath and the palm branch.

PYTHON. A large non-poisonous snake which kills its prey by crushing. Pythons



AFRICAN BLACK PYTHON

Rolled up so that her body is the nest, the reptile hatches the eggs.

Photo: Topical

are found in the tropical regions of the old world. Some species are as large as 25 to 30 ft.

Scientific Name. Pythons belong to the family Boidae. The Indian Python is *Python molurus*.

THE WORLD BOOK

Qq

Q. The seventeenth letter of the English alphabet. In the original Phoenician, from which the letter was derived, its name was *goph*, which meant "head," and in form it was a rude sketch of the back of the head

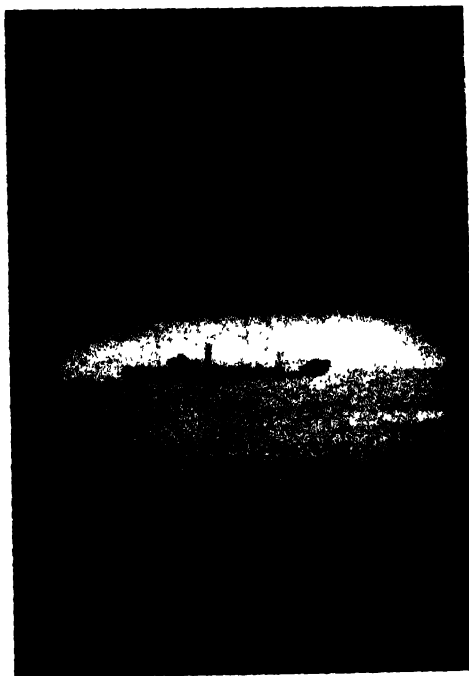
Q

and neck—nothing more than a circle with a short, vertical line running through it. It represented a somewhat different sound from the *kaph*, from which modern *k* is taken; but when the Greeks took over the alphabet, they had no sound for it, and it fell into disuse. The Romans adopted it and made use of it in combination with *u*, as it is used in English to-day. In reality, it is an entirely superfluous letter in English, for its place could be filled by *kw* in all ordinary words, as *queen*, and by *k* alone in such occasional words from the French as *coquettish*.

Q-SHIPS. One of the earlier devices evolved by the British Admiralty during the World War to combat the German submarine menace. They were generally merchant ships—usually steamers—provided with a powerful gun armament, and equipped also with depth charges and sometimes torpedo tubes. Their weapons were concealed by ingeniously contrived structures capable of being dropped out of the way instantly at the moment of action, but which, while in place, gave the appearance of ordinary deck structures. To an attacking submarine they thus bore the appearance of ordinary merchant ships, and the illusion was heightened by the proceedings of the "panic party." These men were drilled to give the impression of a frightened ship's company abandoning their vessel in haste. By such means the submarines were lulled into a sense of security and induced to approach within easy range. At the crucial moment the guns were unmasked, the White Ensign run up, and fire opened.

Service in these vessels demanded a high degree of courage, hardihood and discipline, for the men remaining on board were frequently subjected to the strain of having to remain passive under shell fire. The numerous Victoria Crosses and other decorations awarded were more than well earned.

During the War the Q-ships accounted for thirteen enemy submarines, or 7½ per cent of the number destroyed.



Q-SHIP SEEN THROUGH THE PERISCOPE OF A GERMAN SUBMARINE

QUADRANT, *kwod' rant*. An instrument formerly used in navigation and in surveying

for ascertaining the altitude of the sun. The name was given it because the instrument embodied an arc of 90° , or one-fourth of a circle. See **SEXTANT**.

QUADRILATERAL, *kwod ri lat' er al*. A plane figure having four straight sides. A quadrilateral whose opposite sides are parallel is a parallelogram; its opposite sides being parallel, it follows that they are equal, and that its opposite angles are equal. If the angles of a parallelogram are right angles, the figure is a *rectangle*; if the sides of a rectangle are equal, the figure is a *square*. When all the sides of a parallelogram are equal, the figure is a *rhombus*.

A quadrilateral having one set of parallel sides is a *trapezium*. If the other two sides are non-parallel and equal, the trapezium is *isosceles*.

QUADRILLE, *kwɔ dril'*. A dance of French origin which was popular in the last century. Four couples take part, drawn up in a square, and there are five figures or "sets."

QUADROON, *kwod roon'*. A "quarter-caste," the offspring of a white parent and a half-caste.

QUAESTORS, *kves' torz*. Magistrates of classical Rome. At first, their functions seem to have been concerned with criminal matters, in which they were judges or presidents of trial courts, but later, and under the empire, they served as State Treasurers. Their number at first, like the Consuls, was two; later, under the empire, twenty were appointed.

QUAGGA. An animal similar in appearance to a zebra, and related to the horse. Now extinct, it was recently quite common in South Africa.

QUAI D'ORSAY, *kay dor say'*. The Foreign Office of the Republic of France, i.e. the office of the Minister of Foreign Affairs.

QUAIL. A small game-bird of the pheasant family. The quails proper are the members of a genus found in Europe, Asia and Africa, but several other closely allied genera come under the same name.

The common European quail is in appearance very like a small partridge. It is found in open country, is slow in taking to the wing and seldom flies far. This bird was probably the source of food to the Israelites in the wilderness (mentioned in Exodus, xiv).

At one time the quail was quite common in Britain, but now it is scarce and hardly ever breeds; the number seen varies from year to year.

Scientific Name. Quails belong to the family *Phasianidae*. The European quail is *Coturnix coturnix*.

QUAKERS. George Fox, a preacher and reformer born in Leicestershire in 1624, was the founder of this religious body, which is

more properly called **THE SOCIETY OF FRIENDS**. See **FOX, GEORGE**.

Fox at the age of 19, became convinced of the doctrine of "The Inner Light."

In its briefest significance, this doctrine is that the only guidance needed by the believer is the voice of Christ speaking within him, and that he has no need of Churches, ordinances, ceremonies or sacraments.

Fox first began to attract converts in Manchester in 1647, and in the ensuing years a large number were made. It was natural that the new society, in that intolerant age, should find itself in conflict with authority. Holding that war was unlawful, titles of honour to be repudiated, oaths before magistrates inconsistent with religion, priesthood a vain imagining and tithes not to be paid, the Friends, called in derision "Quakers" for the first time by an irate judge, were persecuted alike by Presbyterians and the Church both in England and America. During the reign of the last two Stuarts, their famous convert, William Penn, did much by his influence to help them, and gave to many a refuge in his colony of Pennsylvania; and after the accession of William III the Quakers were left in peace.

Their manner of worship is extremely simple, and at a meeting they remain in silence until the spirit moves one to pray or to praise God or instruct or exhort the brethren. Their Church organization is Presbyterian in its basis. Elders and Overseers are appointed to look after the work of ministry, the education of children and the care of the congregation, and there are monthly, quarterly and yearly synods.

QUANTITY. When anything has size, weight, number, mass, or volume which may be measured, increased, or diminished, it has quantity. The term may also mean a certain or considerable amount.

In mathematics, numbers are numerical quantities (see **NEGATIVE QUANTITY**). In prosody, quantity signifies the relative length of time occupied in pronouncing a syllable, in music, the quantity of the note denotes the relative length of time it is held.

QUANTOCK HILLS. See **SOMERSETSHIRE**.
QUANTUM THEORY. A theory proposed originally in 1901 by the German physicist Max Planck (born 1858) and founded on the supposition that energy is discontinuous. According to Planck's hypothesis, when a body radiates or absorbs energy, the vibrating atoms or electrons lose or gain energy in sudden jumps, and the energy is emitted or absorbed in discrete units called *quanta*. Planck was led to this conception in the effort to explain a perplexing difficulty in regard to the distribution of energy in the spectra of bodies emitting heat. In the long

wave-lengths, there was a difference between theory and experiment that could not be overcome when referred to the classical theory, which assumes that bodies emit and absorb energy continuously, by imperceptible degrees. Though he originally applied the new theory to the constitution of heat radiation alone, in 1912 Planck made it include all kinds of radiation, limiting it, however, to the emission of energy. Many authorities to-day regard it as applicable both to emission and absorption.

According to the classical theory, a vibrating system may contain any amount of energy. In the quantum theory, the contained energy of a radiating body is an equal multiple of the quantum peculiar to that body. The quanta are not the same for all radiators, because the value of the energy unit is always proportional to the frequency of the vibrations (number of oscillations per second). In all cases, there is a fundamental quantity called *Planck's constant*. Multiplying this constant by the frequency of the oscillating body gives the value of the quantum in ergs. Mathematically, these relationships are expressed as follows: $E = h\nu$, where h is Planck's constant and ν is the vibration frequency. The numerical value of h is 6.56×10^{-27} .

As an example, take the frequency at which a heated body radiates the largest possible amount of energy in the infra-red region. This frequency is about 1.5×10^{14} . The corresponding quantum is therefore $6.56 \times 10^{-27} \times 1.5 \times 10^{14}$, or approximately one ten-millionth of a millionth of an erg. Energy emitted in units so minute seems continuous to the human mind, but it should be remembered that, in science, infinitesimal size of units does not deny their separateness. The concept of discontinuous energy is in keeping with the discontinuity of matter and electricity.

The quantum theory has been applied with notable success to the photo-electric effect, which concerns the property possessed by certain bodies, especially metals, of emitting electrons when subjected to the action of light. Its greatest triumph, however, has been its application to the structure of the atom, an achievement of the Danish physicist, Niels Bohr. According to the generally accepted theory, the atom consists of a central nucleus, about which revolve electrons in orbits similar to those followed by the planets in their journeys around the sun. Dr. Bohr regards each of the planetary electrons as revolving in a fixed orbit, or *quantum path*, and as moving in that orbit with an invariable speed. During its rotation about the nucleus, the electron does not radiate energy, but it may

be excited to move from its orbit to an inner one, or may be "kicked" entirely outside the orbital field, and start moving back. Whenever an electron moves from one orbit to another, it does so in definite jumps, and in the process it liberates a quantum of energy.

The classical theory of the propagation of light in transverse waves through a medium called the ether has not been reconciled with the quantum theory. See ATOM; CHEMISTRY; ELECTRICITY; LIGHT; PHYSICS.

QUARANTINE, *kwor' ran teen*. The segregation of persons and of certain animals infected or likely to be infected with any dangerous disease, especially in harbours visited by sea-going ships. Under the Port Sanitary Regulations, which were issued in 1933 as a result of the International Sanitary Convention held at Paris in 1926, the master of any "foreign-going" ship entering a British harbour is charged with the duty of ascertaining the state of health of all persons on board. If there is disease on the ship he should communicate with the harbour authorities, and a separate mooring station will then be provided. No one may board or leave a ship in harbour without the permission of the sanitary authorities.

Under the quarantine laws certain animals, such as musk-rats, may not be imported, and all animals subject to rabies, more especially dogs, must spend the six months after landing in quarantine quarters.

QUARRY AND QUARRYING. A *quarry* and a *mine* differ in that the former is an excavation in the earth open to the light, from which are taken large masses of rock of high marketable quality. In a mine the mineral sought for lies well below ground level, and shafts are sunk, down which the miners descend to reach the mineral seam. There are three processes which are employed in a quarry for detaching material. One is known as the *plug-and-feather* method; another, the *explosive* method; the third, *channelling by machinery*.

Plug-and-Feather Method. Pressure, constantly increased and exerted uniformly, will split a mass of rock along a line of cleavage. By employing such means, workmen can break rock into such masses and into such shapes as suit their needs.

The principal tools in the plug-and-feather method are a wedge, or plug, flat on its two opposite surfaces, and two "feathers," pieces of steel, each rounded on one side and flat on the other. Into the rock, in a straight line at short intervals, holes about three-fourths of an inch in diameter are drilled. A plug is placed between two feathers, and these three pieces are inserted in a hole. When all the holes along the line where the rock is to be

broken are thus filled, the workmen begin to drive the plugs and feathers downward. Each of the wedges thus formed is driven only a little way at a time, and thus the pressure is kept practically uniform; eventually it is so great that the rock breaks.

Explosive Method. Usually, this is employed in detaching great masses of rock from their beds, and for this process either dynamite or gunpowder, connected at a safe distance with a slow-burning fuse, is commonly used, the choice depending upon the results sought from the explosion. If finely broken pieces of stone are desired, and these are to be further crushed for road-making, for manufacturing concrete, and the like, dynamite acts powerfully. When stones of as large size as possible are sought, the milder explosive is employed. In either instance, drill holes are sunk deep into the solid mass of rock parallel to the exposed perpendicular face of the mass; into these the explosive is then poured, and electric wires are connected with each charge. The explosions resulting when the charges are fired are thus simultaneous.

Channelling Machine. Many large quarries employ an ingenious device to make the first cuts into a solid bed of rock. This so-called channelling machine looks not unlike a miniature locomotive. Attached to its sides are sets of long, pointed chisels. The entire machine moves along a track on the smooth surface of the solid rock, and in its progress the chisels are forced downward. Little by little, they cut channels in the rock to any desired depth, even to one of 10 ft., the width of the channel is a little more than an inch.

There are in Great Britain many districts particularly well known for the excellence of the stone quarried, thus Aberdeen is noted for its granite, Bath for its building stone, Purbeck for its marble, Kent for its ragstone, Durham for its limestones, and Blaenau Ffestiniog for its slate.

QUART. A measure of capacity used in Great Britain, United States, and Canada for measuring both dry and liquid substances. In Great Britain the liquid and dry quart is equal to one-fourth of a gallon, and contains 69.3185 cub. in., or 1.136 litre. The American quart is equal to approximately five-sixths of the British quart. For metric equivalent, see **Metric System**.

QUARTER DAY. A day fixed by law on which rent, and other payments, payable

quarterly, fall due, and on which quarterly tenancies are determined. Quarter Days in England are 25th March (Lady Day); 24th June (Midsummer Day); 29th September (Michaelmas Day); and 25th December (Christmas Day). In Scotland they are 2nd February (Candlemas); 15th May (Whitsuntide); 1st August (Lammas); and 11th November (Martinmas).

QUARTER-DECK. That part of the upper deck of a boat lying between the stern and



MARBLE QUARRY
Photo Georgia Marble Co

mast, which in men-of-war is reserved for the use of officers alone.

QUARTERMASTER. In the old sailing Navy, *quartermasters* were petty officers whose primary duty was to take charge of the wheel and supervise the work of the *helmsmen*. In the later years of the last century the substantive rating of quartermaster was abolished, and the designation was applied to the ratings selected to perform this special duty, in large ships petty officers, in smaller ships leading seamen or able seamen. The Chief Quartermaster, who in large ships is a senior petty officer or chief petty officer, acts also as an assistant to the Navigating Officer.

In the Mercantile Marine the appellation

quartermaster is applied to seamen who perform similar duties.

In the Army, the Quartermaster is the officer charged with the custody of ammunition and such stores as equipment and clothing and rations. There is a quartermaster to each battalion and equivalent unit. In the British Army, Quartermasters are appointed from selected warrant or non-commissioned officers, and are commissioned. They commence with the rank of lieutenant, and may rise to lieutenant-colonel, their special status being denoted by the coupling of "Quartermaster" with their rank, as "Captain and Quartermaster." In the Indian Army, the duties of Quartermaster are performed by a subaltern officer.

QUARTER SESSIONS, COURTS OF.

These are either County Courts of Quarter Sessions or Borough Courts of Quarter Sessions. All counties have a County Court of Quarter Sessions, composed of all the magistrates of the county, two forming a quorum. Only large and important boroughs have a Borough Court of Quarter Sessions, and this is presided over by a judge called the Recorder. As their name implies, Courts of Quarter Sessions sit four times a year. The Court of Quarter Sessions is mainly a criminal court, and is both a court of first instance and a court of appeal. As a court of first instance, it has jurisdiction to try all offences except the gravest, such as treason, murder, bigamy, abduction, perjury, and any offence (other than burglary) punishable with penal servitude for life. As a court of appeal, it hears appeals from the decisions of Courts of Petty Sessions. The Court has also a limited amount of civil and administrative work in connection with highways, lunatics, licensing, and the inspection of prisons.

QUARTET. A musical composition for four voices or instruments, string quartets are written for viola, cello and two violins, or a piano part may take the place of one violin. The quartet reached perhaps its highest development with Beethoven, Mozart, Schubert and Brahms.

QUARTO. See FOLIO.

QUARTZ, kworts. A compound of silicon and oxygen, and one of the most common of minerals. It is a constituent of many rocks, such as granite and gneiss, and is easily recognized in granite by its resemblance to broken glass. Most sandstones consist of small grains of quartz (sand) held together by some binder, as silica, iron oxide or clay. Quartz is the hardest of the common minerals; is highly resistant to weathering processes, and is insoluble in most acids.

Pure transparent quartz, which is commonly called *rock crystal*, is sometimes cut for

gem purposes under the name of *Bristol diamond*. Varieties of transparent quartz coloured by impurities include *amethyst*, which is violet; *false topaz*, pale yellow in tint; and *rose* and *smoky quartz*. Chalcedony, flint, and jasper are fine-grained forms of this valuable mineral.

Quartz is employed in making sandpaper, grindstone, and various other abrasives;



CRYSTALS OF QUARTZ
Photo H. E. Taylor

quartz sands are extensively used in the manufacture of glass and mortar, and for many other purposes. Rock crystal is employed in making optical apparatus, and is superior to glass for lenses of microscopes, for making instruments to effect cures by transmitting ultra-violet rays, and for devices used in astronomy and photography. It is employed also in wireless and television apparatus. Chemical formula SiO_2 .

QUARTZITE OR QUARTZ ROCK. A white, grey, pinkish or yellowish rock composed principally of quartz. In most cases it is a metamorphosed sandstone but the name is also given to a sandstone or a grit cemented by silica which has been deposited in optical continuity around each grain. Quartzite is usually found among the oldest geological strata. It may be recognized by its hardness, lustrous surface and its resistance to weathering and the action of acids. The Hartshill quartzite of Cambrian age found at Nuneaton is extensively quarried for use as road metal.

QUASSIA, kwosh'ia. A tree native to Jamaica. The wood is valued for a bitter principle which is extracted from it. This extract is used medicinally and also in making up an insecticide. For the insecticide, 4 oz. of quassia chips should be boiled in a little water for twenty minutes to half an hour. The liquid is now strained and in it is dissolved 2 oz. of common soft soap. The resulting mixture will, when diluted, make

3 gal. of an insecticide harmless to plants but deadly to the aphid fly, etc.

Scientific Names. The quassia belongs to the family *Simarubaceae*. The Jamaica quassia is *Picramnia excelsa*. Another variety from Surinam is *Quassia amara*.

QUATERNARY, *kwā ter' nā ri*, PERIOD.

The second period of the Cenozoic Age and the latest period of geologic time, extending from the end of the Tertiary Period until and including the present time. The name, which means "fourth," is a survival of an early classification in which the rocks now named Palaeozoic were called *Primary*, and those now named Mesozoic were called *Secondary*. The period comprises two epochs—the Pleistocene, commonly called *Ice Age*, and the Holocene, also called *Recent*, *Present*, or *Human Age*. The Quaternary Period is characterized by the appearance of the earliest known men upon the earth. For this reason, it has sometimes been called the *Age of Man*, and was formerly set off by some geologists in a separate era called the *Psychozoic*. See GEOLOGY.

QUATRAIN, kwot' rayn. Term early used to describe a stanza in four lines, usually with, alternate rhymes (in French *à quatre mains*, for four hands). In obsolete music, "quatrible" was the word used for progression by parallel fourths. Quintrain and "quinible" (to descant by singing fifths) were used in like association. A "quatrible" was a descant in fourths, as the "quinible" was one in fifths.

QUAVER. In music, a note one-eighth the duration of a semibreve. See MUSIC.

QUAY, ke. Artificial embankment bordering a navigable waterway or the sides of an enclosed dock (which see) for the reception and mooring of ships and other craft. See WHARF.

QUEBEC. Known in early days as LOWER CANADA, or CANADA EAST, Quebec is the oldest and the largest province of the Dominion of Canada.

It extends eastward to the Atlantic Ocean and northward to Hudson Strait, and the greater part of its western boundary is formed by Hudson and James Bays, the remainder by Ontario. Labrador, belonging to Newfoundland, separates it from the ocean on the north-east.

From 1912, when the province annexed the territory of Ungava, to 1927, Quebec had an area of 706,834 square miles. However, the settlement of the dispute over the Quebec-Labrador boundary, reached by the Privy Council in 1927, gave to Labrador 112,300 square miles of the disputed territory. Quebec's area was reduced, therefore, to 594,534 square miles.

The People. When Canada became a

British possession in 1763, there were about 70,000 French in the country. The British government allowed these new subjects to retain their laws, religion, language, and social customs; these have been handed down from one generation to another practically without change.

In many parts, French is the common language and English is seldom heard. In the part west of Montreal, and in the Eastern Townships, the great majority of the inhabitants are of English and Scottish descent. The region was originally settled by people from the English colonies who sided with England in the Revolutionary War. The total population of Quebec in 1935 was 3,073,000.

About 90 per cent of the people are communicants of the Roman Catholic Church.

Physical Features and Climate. Quebec is naturally divided into three regions—the plateau north of the St. Lawrence, the long, level plain bordering the river on the south, and the region crossed by the Notre Dame Mountains and comprising the south-eastern counties. The plateau north of the St. Lawrence is part of the Laurentian plateau of ancient crystalline rocks. Its steep southern edge forms the Laurentian Mountains.

The lowland bordering on the St. Lawrence is nearly level, but it is crossed by a number of isolated extinct volcanic peaks extending from north to south, and known as the Monteregian Hills. The region crossed by the Notre Dame Mountains, which are a low extension of the Appalachian system, is rolling and hilly and in some places mountainous. The highest peak, Mt. Jacques Cartier, has an altitude of 4350 ft.

Quebec is a land of lakes and rivers. The St. Lawrence is the great gateway to the interior of the vast continent, and the main artery through which most of the rivers of the province find an outlet to the sea. The principal streams flowing into the St. Lawrence from the north are the Ottawa, noted for its volume of water and falls, and the Saguenay. On the south are the Richelieu, which drains Lake Champlain; the Chaudière; and the St. Francis.

The great region north of the height of land is drained into Hudson Bay and the Atlantic Ocean, and it is the portion which drains into the Atlantic that is now part of Labrador.

In the southern part of the province and along the St. Lawrence, the summers are warm, with occasional hot days, and the winters are long and cold, with deep snows. The northern part of the province has a cold climate, with long, severe winters, and short, hot summers. Everywhere the rainfall is ample for agriculture.

Plants and Animals. In the valleys of the St. Lawrence and the Ottawa and in the Eastern Townships are forests of oak, ash, maple, spruce and pine. Nearly all the vast territory north of the St. Lawrence is covered with forests of spruce, tamarack, and jack pine.

The moose, caribou, deer, bear, and lynx are the valuable large animals, while among the smaller animals are the otter, mink, fox, weasel, musk-rat, skunk, and beaver, all valuable for their fur.

Minerals and Mines. Quebec supplies about 80 per cent of the world's output of asbestos, the mines being situated in the Eastern Townships. The annual output of cement, marble and limestone is great. Copper is mined in the Eastern Townships, and silver in paying quantities is obtained in the reduction of the ore. Gold and copper-bearing sulphides have been found in quantities in Western Quebec. Owing to the absence of coal, little iron is mined. Graphite, phosphates, mica, manganese, and a number of other minerals exist.

Fisheries. Fishing is an important occupation for the people dwelling along the shores of the Gulf of St. Lawrence. Cod, herring, and salmon, in the order named, yield the largest revenue. Lobsters and mackerel are also taken in large numbers.

Forests and Lumber. The forest area of Quebec is not fully known, as the great forests of Ungava have been only partially surveyed. However, it is known that north of 54° latitude the country is barren and practically without trees. Exclusive of this unsurveyed portion, there are about 150,000,000 acres of forest. Lumbering is one of the leading industries, and is carried on chiefly around the sources of the Ottawa, the Gatineau, and the St. Maurice.

Both the Dominion and the provincial government exercise close supervision of the forests, and the cutting of timber on all leased lands is so restricted as to prevent destruction of the forests.

Agriculture. This has become the leading occupation. Over one-half the occupied land is under cultivation, the cultivated area amounting to nearly 6,000,000 acres. This, however, is but a small part of the arable land in the province.

The growing of crops such as hay, grain, potatoes, etc., dairying, and livestock-raising are the main branches of agriculture, though fruit-farming is also important. Oats is the principal grain, followed by barley, buckwheat, spring wheat, and maize. Soil and climatic conditions for flax are favourable.

Tobacco is grown, but the industry is at an early stage of development. The maple-sugar production, though still important, has

decreased in recent years with the introduction of synthetic syrup.

Quebec produces annually about 112,000 barrels of apples, as well as large quantities of pears, plums, and strawberries, and the Montreal musk-melons are famous. Bee-keeping is encouraged. Livestock-raising, including the breeding of cattle, horses, sheep, and swine, is particularly suited to the climate of Quebec, and the dairy industry has been long established. Most of the butter is produced on the farms, but there are many creameries and cheese factories. There are (1934) 2279 fur farms, breeding chiefly foxes.

Manufactures. Quebec ranks next to Ontario in the value and variety of its manufactures, with more than 8000 industrial establishments. Almost every stream is a source of water power, and the provincial government has reserved the water rights of most of the streams and lakes, leasing them to private companies. The forests offer the resources for the most important manufactures—the pulp-and-paper industry leads the list. Also important are textiles, leather and boot and shoe factories, and ironworks.

Transport and Commerce. The St. Lawrence River is navigable for ocean-going vessels as far as Montreal. The Richelieu is obstructed by rapids at Chambly, but a canal at that point makes the river navigable for its entire length for boats of light draught. The Canadian Pacific and the Canadian National railways, with their branches, furnish ample railway facilities.

Montreal and Quebec are the leading commercial centres, and from the port of Montreal large quantities of wheat, grown in the North-west provinces, are shipped to Europe. Montreal is, in fact, the greatest grain-exporting port on the continent. Other leading exports are lumber, wood pulp, butter and cheese, beef, and fruit. Most of the foreign trade is with Great Britain and the United States. The imports consist almost wholly of manufactured products, such as clothing, textiles, machinery, and hardware.

Education. The public schools are Protestant or Catholic. There are high schools, special schools, including agricultural, technical, domestic science, arts and trades, and fine arts institutions; and schools for higher commercial studies. The universities are those of McGill (1841), Lennoxville (1845), Laval (1852) and Montreal. The latter two are Roman Catholic. See CANADIAN EDUCATION (Dominions volume).

Government. The chief executive is a Lieutenant-Governor, appointed by the Dominion government. He is assisted by a Council of Ministers, who are responsible to the Legislative Assembly. The head of the

council, or Premier, is the executive head of the government. The Legislature consists of two Houses—a Council of twenty-four members appointed for life, and an Elective Assembly of ninety members elected for five years. Quebec has sixty-five members in the Dominion House of Commons, and the number from each of the other provinces is regulated by this number, which was originally assigned to Quebec with the provision that it should remain unchanged. Twenty-four Senators are sent to the Dominion Senate. Quebec is the only Canadian province which does not enfranchise women.

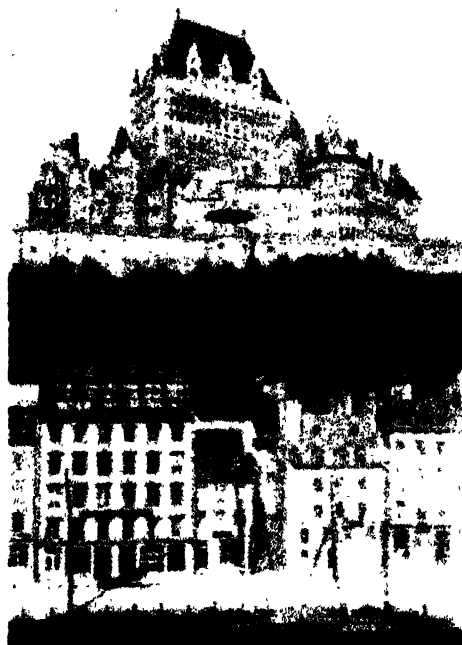
History. Until the conquest of Canada by Great Britain, 1759-1763, the history of Quebec was the history of New France. For a detailed account of this period, see CANADA.

The Treaty of Paris (1763) ceded Canada to Great Britain. A radical change of administration followed. But the French civil laws and institutions were respected, and free use of the French language was granted in the government and education.

In 1791 the English settlers in the western part of Canada petitioned for a separate government, and the provinces of Upper Canada (Ontario) and Lower Canada (Quebec) were organized. In 1812 there was a growing antagonism between the British and French elements of the population, but the War of 1812-1814 between Britain and the United States served to unite these nationalities in support of the British Government. In 1867 Quebec became a province of the Dominion of Canada.

During the century-and-a-half of their existence under British rule, the French-Canadians have been insistent upon retaining their native language and social customs. There is a provincial organization for maintaining the purity of the French language.

QUEBEC, CITY OF. Capital of the Canadian province of Quebec and the only walled



CHATEAU FRONTENAC, QUEBEC, WITH THE OLD TOWN BELOW

city in North America—it is situated on the St. Lawrence River just above its junction with the St. Charles. The *Citadel* crowning the city has fortifications enclosing a forty-acre parade-ground. Round this is the *Upper Town*, in which are the chief residences, public buildings, churches, gardens and retail shops. The *Lower Town*, built round the base of Cape Diamond on a narrow strip of rocky land, has the narrow, cobblestoned streets of an old French provincial



QUEBEC CITY FROM THE ST. LAWRENCE RIVER
Photo—Canadian Pacific Railway

town. Covered bridges between the houses span the roads in many places. Hereabout is the commercial centre of Quebec.

Although floating ice makes winter navigation impracticable, Quebec is an important port, for even the largest steamers can float at all times in the harbour, which has one of the largest dry docks in the world. Lumber, formerly rafted down the river but now brought by rail, is the chief export, and there is also a large foreign trade in cattle and grain. Industrial establishments include boot and shoe factories, tanneries, machine shops, iron and steel plants, printing and binding works, and manufactories of wood-pulp, food products, clothing, cigars and cigarettes. Population (1934) 140,000.

History. Jacques Cartier took possession for France of the site of the modern city in 1535, and in 1608 Samuel de Champlain founded Quebec. It was captured by the British in 1629 but returned in 1632, and became the capital of New France in 1663. Captured by General Wolfe in 1759, Quebec was ceded to Britain in 1763.

QUEBEC, BATTLE OF. See SEVEN YEARS WAR, QUEBEC, SIGES OF (Dominions Volume, CANADA).

QUEEN ANNE'S BOUNTY. A corporation established by Letters Patent in 1704, its full title is "The Governors of the Bounty of Queen Anne for the Augmentation of the Maintenance of the Poor Clergy." The Governors are numerous, namely all archbishops, bishops, deans, Privy Counsellors and judges, the Speaker of the House of Commons, the Lord Mayor and Aldermen of the City of London, and many others. Any five governors, three of whom must be archbishops or bishops, make a quorum. Its primary object is to assist poor clergymen, mainly in the upkeep of their parsonages. Queen Anne's Bounty formerly received all "first fruits" and "tenths," which were payments made by beneficed clergymen. The right to these was transferred from the Pope to the Crown in 1535. These payments were abolished in 1926, and the income of Queen Anne's Bounty is now chiefly derived from investments accumulated in the past. Since 1927 the Bounty has also been charged with the duty of collecting all tithe rentcharges belonging to the Church. In 1936 a plan for the reduction and gradual redemption of tithe rentcharges was introduced by the Government. See **TITHE**; **BENEFACT**; **ECCLESIASTICAL LAW**.

QUEEN CHARLOTTE ISLANDS. See Dominions Volume, CANADA.

QUEENSBERRY, EARLS, MARQUESSSES, AND DUKES OF. The first Earl of Queensberry was Sir William Douglas, the feudal chief who entertained King James VI, when

he returned to Scotland in 1617, at his mansion of Drumlanrig. He was raised to the Peerage of Scotland, 1st April, 1628, as Lord Douglas of Hawick and Tibbers and Viscount Drumlanrig, and was created Earl of Queensberry 13th June, 1633. The first Duke of Queensberry (William Douglas) received that title in 1682, and at the same time was made first Marquess of Queensberry. On the death of the fourth Duke, who died in 1810, aged 85, unmarried, the ducal title devolved upon the Duke of Buccleuch, while the original title of Marquess of Queensberry descended upon Sir Charles Douglas.

John Sholto Douglas, eighth Marquess of Queensberry, notable sportsman, was born 20th July, 1844, and was a representative peer of Scotland from 1872 to 1880. He took special interest in boxing. In conjunction with John G. Chambers, founder of the Amateur Athletic Club, he drew up a code of laws, known as the Queensberry Rules, which govern all glove contests in Great Britain. The present, the tenth Marquess, is his grandson.

QUEENSLAND. The second largest state of the Australian Commonwealth, ranking next to Western Australia, it occupies the entire north-eastern part of the continent, with an area of 970,500 square miles. The Great Barrier Reef, a coral reef off the east coast, extending for a distance of over 1200 miles, encloses a broad, quiet expanse, dotted with numerous islands and forming many fine harbours.

From a narrow coastal lowland, scored by many streams, the country rises into the old rocks of the Eastern Highlands of Australia, reaching in places over 5000 ft. These highlands are linked in the north by the Kynona and Selwyn uplands with the old Western Plateau, but the greater part of the interior of Queensland is the great Artesian Basin. The most important navigable rivers are the Brisbane in the south and the Fitzroy on the southern tropic.

The climate is warm, the thermometer reaches 80° F. in January and seldom falls below 56° in July. Frost and snow occur only in the elevated parts. Rainfall on the east is heavy in summer but slight in winter. The interior has little rain.

Resources. A million and a half acres are cultivated, of which the greater part is under crops of wheat, sugar cane, fodder, hay, maize and cotton. Bananas, pineapples, oranges, tobacco, grapes and several other crops are grown. Sugar employs more people than any other crop, and there are 33 crushing mills. Cotton fluctuates in acreage, but is not on the whole increasing, though American upland cotton does well. Agriculture is mainly in the east and south-east, but wheat



NEAR DOUBBLE ISLAND, QUEENSLAND

Photo: Australian Trade Publicity

is found further west. The problem of labour is important in relation to tropical crops since the abolition of coloured labour in 1901. Evidence is not conclusive that white labour will offer a permanent solution of the problem, and in any case settlement is slow. Cattle, especially for dairy purposes, are growing in importance, but vary in number with the rainfall. In 1935 there were 5,971,299 head of cattle. Sheep numbers vary from 17 to 22 million, and are chiefly west of the highland. Artesian water is important in the sheep and cattle industry. In 1933, 1426 flowing wells were providing 278 million gallons of water a day. A large number of bores also yielded water by pumping. Several river irrigation schemes are proposed. Coal, gold, silver and copper are mined; coal production reaches 1,000,000 tons a year at Ipswich, and iron ore is thought to be abundant. Thursday Island in Torres Strait is a pearl-fishing centre.

The People. The inhabitants number about 973,905, according to an estimate in 1936. The majority are Australian-born or are from the British Isles, the remainder chiefly Asiatics and Polynesians, with 12,500 aborigines.

There is no State Church, but over one-third of the inhabitants are members of the Church of England. The Roman Catholics constitute the next largest religious body, followed by the Presbyterians.

Primary education is free and compulsory, and the percentage of illiteracy is low.

Transport, Towns and Trade. Queensland is linked by rail with other parts of Australia. It has a line along the greater part of the east coast, with a number of branches into the interior to link up pastoral and mining centres. There are 6566 miles of railway, all State-owned. Exports are chiefly wool, sugar, butter, cheese and meat. The only large town is Brisbane, the capital, about 10 miles inland on the Brisbane River; it is an important seaport with a large export trade, population 304,950 (1934). Townsville, Rockhampton and Toowoomba each have about 30,000 inhabitants.

Industries are chiefly connected with cotton and sugar manufacture, and brewing, meat packing, and tanning.

Government and History. The Governor, appointed by the British Government, is assisted by an executive council of ten ministers. The legislature consists of a Parliament made up of the legislative assembly of seventy-two members, elected for three years. The State is represented in the Commonwealth Parliament by ten Representatives and six Senators.

Portuguese in the sixteenth century were probably the first Europeans to sight the north coast. Captain Cook discovered the east in 1770, and took possession, calling it New South Wales. The first settlement was a penal colony, established in 1824 on Moreton

Bay. The convict population gradually disappeared, and attempts to re-establish it were frustrated by the free inhabitants. In 1840 the region was opened to free settlers only. In 1859 Queensland, which had been a part of New South Wales, was made a separate colony, and in that year and also seven years later, rich goldfields were discovered. Finally, in 1900, the colony of Queensland became a state of the Australian Commonwealth.

QUEENSTOWN (COBIT). See MUNSTER.

QUERCUS.

See OAK.

QUETTA,

kwel' a. The capital of Baluchistan (which see).

QUETZAL,

kel' sal A brilliantly coloured bird of the trogon family, found in Central America. It has a short neck, small feet, a round crest and enormous tail coverts, $3\frac{1}{2}$ ft. long. The upper part is bronze green, the lower crimson. The female



THE QUETZAL

has a tail that when captured, it will curl up and break its way out and then it is a perfect

has no long tail coverts, and is coloured brown and buff.

QUEUE, *la* The long hair of Chinamen, worn in a single braid. The term is also used to describe a file of persons, vehicles or the like, awaiting their turn where order or rotation is necessary. This meaning is taken from the French word (*queue*) for tail.

QUICKLIME. See LIME.

QUICKSAND. A mass of loose sand mixed with water to such an extent that it is incapable of supporting a heavy body. The grains of sand, which have smooth, rounded surfaces, do not cling together to form a compact mass. Quicksands are often formed in the mouths of rivers or in their channels, or on sea-coasts.

QUICKSILVER. See MERCURY.

QUILLER-COUCH, SIR ARTHUR THOMAS (born 1863). English author and critic, well known under the pen-name of "Q"; born in Cornwall. After taking his degree at Trinity College, Oxford, where for a time he lectured in classics, he began his successful career as editor and writer. He was knighted in 1910, and two years later was appointed

King Edward VII Professor of English Literature at Cambridge.

The first publications of Quiller-Couch were romances in the style of Stevenson, and include *Dead Man's Rock*, *Troy Town*, and *The Splendid Spur*. Among novels are *The Blue Pavilions*, *The Ship of Stars*, *Fort Amity*, and *News from the Duchy*. He has also written short stories, volumes of poems and essays, and has collected and edited anthologies of English poems—*The Golden Pomp*, *The Oxford Book of English Verse*, *The Oxford Book of Victorian Verse*, and *Oxford Book of Ballads*. Among his essays are *Adventures in Criticism*, *From a Cornish Window*, *On the Art of Writing*, *Shakespeare's Workmanship*, and *On the Art of Reading*. Most of these are reprints of his University lectures.

QUINCE. A tree of the rose family. The fruit, which somewhat resembles the pear, cannot be eaten raw because of its excessive



QUINCE, FOLIAGE AND FRUIT

Photo E J Hosking

hardness, but is used to flavour marmalade, jellies and cooked fruit. The quince is grown more commonly in America than in England, where it is mainly used as a stock for pears.

Scientific Name. The quince is in the family Rosaceae. It is *Pyrus cydonia*.

QUININE, *kuin' een*. A bitter alkaloid obtained from the bark of certain trees (genus *Cinchona*) native to South America. Quinine is chiefly valuable as a specific

remedy for malaria. It is also effective in allaying fever, and is a nerve stimulant and general tonic through its power of increasing the flow of the digestive juices. In influenza, neuralgia, and headache, the drug is taken for the relief of pain. It is a common remedy for colds. Large doses cause ringing in the ears, dizziness, and pain in the head, and dangerously affect the blood pressure, even causing death. Chemically, quinine is a compound of carbon, hydrogen, oxygen and nitrogen.

QUINNAT, *kwín' at*. A species of salmon.

QUINSY, *kwín' zī*. A form of severe sore throat which results in the formation of an abscess in the region of the tonsils. One or both sides may be affected. It is caused by germ infection, following exposure to cold or dampness, and begins with chills, exhaustion, fever, and pain in the throat. As the disease progresses, the tissues about the tonsil swell until swallowing and even opening the mouth become difficult and painful. In severe cases, the patient has alternate chills and sweats, and at night becomes delirious; though the ailment is not usually fatal, generally ending in from five to eight days with the bursting of the abscess. The patient should rest quietly in bed, gargle the throat, and take purgatives. Lancing the abscess, with draining of the pus, always brings immediate relief. Quinsy does not usually attack children or people past forty. See TONSIL.

QUINTAIN or **QUINTEL**. An object or target at which lances were tilted as a test of the skill of horsemen or foot soldiers, on similar lines to the modern sport of "tilting the bucket." The quintel in medieval times, consisted of a sand-bag, which, unless struck in the right place and at the right angle by the lance of the charging horseman, would empty itself over the head of the tilter. See KENT (illustration).

QUINTILIAN, *kwín' til' ian* (MARCUS FABIIUS QUINTILIANUS) (about A.D. 40-circa 118). A Roman rhetorician, born at Calagurris, in Spain. Information about his life is meagre, but it is probable that his family removed to Rome while he was a boy. After spending some years in Spain, he returned in 68 to Rome with Galba, and began to practise as an advocate. It was as the head of a school of oratory that he was best known, however, and Vespasian created for him a chair of rhetoric. He taught for about twenty years, and after his retirement spent two years in the composition of his great work—*Institutio Oratoria*, an exhaustive system of rhetoric, dealing with the training of a would-be orator from infancy. Quintilian's literary judgments are sympathetic, perhaps the best in ancient literary criticism. There are extant 164 declamations which have been credited to Quintilian, but by

far the greatest quantity are almost certainly the work of others.

QUIRINAL, *kwir' ri' nal*. One of the Seven Hills of ancient Rome, to which Romulus is traditionally said to have extended the city, and which was later included in the area within the Servian Wall. Quirinus was the god in whose honour the hill was named.

QUIRINUS, *kwir' ri' nus*. In ancient Rome, the name of a deity who held third place in the Pantheon; only Jupiter and Mars were honoured more than he. At the time of the supremacy of Rome, there grew up a tradition that this god was Romulus in his deified state. Extraordinary honours were paid him, and his festival was on 17th February. See ROMULUS; PANTHEON.

QUIRITES, *kwir' ri' leez*. The formal name by which the ancient Romans were addressed when gathered together in a national assembly. In Roman Law, *jus quiritorium* meant the laws applicable to Roman citizens, different laws being applied to non-citizens.

QUITO, *ke' to*. See ECUADOR.

QUIT-RENT. A rent paid by freeholders and copyholders of a manor in discharge of all dues, obligations, and services owed by the tenant to his lord, a survival of the Feudal System. When the tenant was "acquitted" of the services due from him, the rent was compounded into an annual sum.

QUIXOTE, *ke' hō' tay*, DON. See CERVANTES.

QUOITS, *kwōits*. A pastime resembling discus-throwing, and consisting in the tossing of iron rings, also called quoits, a peg thrust into the ground. The pegs are usually set 18 yds apart. The quoits are 8 in. in diameter, with a rim from 1 to 2 in. in breadth. Each player pitches two quoits, and then yields his place to an opponent. The aim is to ring the peg with a quoit. A score of 11 constitutes a game for two players and 15 for four. By the most usual method of scoring, a *ringer*, a quoit which encircles the peg, counts 2; a *leaner*, a quoit which leans against the peg, counts 1; and if there are no ringers or leaners, the nearest quoit within 2 ft. of the peg counts 1.

QUORUM, *kwor' um*. In the organization of an assembly, a quorum is the number of members who must be present in order that the body may transact business legally.

QUO WARRANTO. A writ first issued in the reign of Edward I for a commission of inquiry on behalf of the Crown against any person who claimed or usurped an office or franchise, or any special privilege or immunity from the ordinary law, in order to ascertain whether, in fact, his right was well-founded. This legal process has now fallen into disuse and has been replaced by an "information in the nature of a writ of *Quo Warranto*" lodged by the Attorney-General.

THE WORLD BOOK

Rr

R. The eighteenth letter of the English alphabet. The Phoenician letter from which it was derived was called *resh*, which meant "head"; in form it may have originally represented a head in profile.

4

It was more like a *P* than an *R*, but was turned round with the projection to the left, and this upper part was angular instead of curved. The Greeks adopted the letter and made it precisely like a modern capital *P*, but the Romans added the extra line to distinguish it from the *P*, and with the latter people both *P* and *R* assumed their present forms.

In sound, *r* has many varieties, like the trilled *r* of Scots, the inverted *r* heard in American and some English dialects (*bird*, etc.), the uvular *r* of French and German, the sound heard in English *three*, and the fricative *r* in English *red*. Normally, it is lost in English before other consonants.

RA. The Egyptian god of the sun. See *Ra*.

RABAT, *ra bat'*. See *MOROCCO*.

RABBI, *rab' i*. A title of respect which the Jews applied to a doctor or teacher of the law. Another form of the word, and one denoting greater respect, was *rabbouni*. Neither of the words was used at the Old Testament period, but they seem to have been in general use at the time of Christ. *Rabbi* is now the title of the minister or preacher in the Jewish synagogue.

RABBIT. A member of the rodent group (the gnawing animals). The wild rabbit is a native of Europe, but introduced species are found in most parts of the world. Rabbits belong to the same family as the hares, but differ from them in appearance, in that they are smaller and have shorter ears and legs; they differ also in habits, living in colonies in underground burrows, called *warrens*, and giving birth to blind, almost hairless, young. They multiply rapidly, breeding several times a year. They begin breeding at the age of six months, and produce five to eight young at a birth.

Native rabbit fur is soft and fine, and of a nearly uniform brownish colour. The fur of specially bred types either when white, or dyed in a variety of colours, is important in the fur trade. It is marketed under numerous names, though its own particular trade name is *cony*, the old name of the rabbit.

Domesticated Rabbits. The following are the more important kinds of domesticated rabbits —

Belgian Hare. This is one of the best-known varieties, and is a true rabbit. It is a



WILD RABBIT
Photo U. & C.

large animal, weighing about 10 lb., and has a broad head which tapers to the nose; the long ears are thin and translucent.

Lop-Eared Rabbit. This rabbit, distinguished by its long ears, which are about 12 in. in length, is the oldest fancy variety.

Dutch Rabbit. This rabbit, which weighs only 4 lb., is one of the smallest of domestic rabbits. It is hardy and beautifully coloured, the fur being a combination of white and of black, blue, or lemon.

Angora Rabbit. Like Angora goats and cats, the Angora rabbit has a silky coat of white hair about 6 in. long, which can be cut and woven. This breed is also hardy.

Other Kinds. These include the dark, silky-haired *Siberian*; the *Himalayan*, valued for its skin, which closely resembles ermine; the large *Patagonian* and *Flemish* rabbits; the fancy *silvertip*; and the delicate white *Pole*, weighing only 3 lb.

Scientific Name. Rabbits are included with hares in the family *Leporidae*. The common rabbit is *Lepus cuniculus*.

RABBIT-FISH. Living in water from 2000 ft. to 3000 ft. in depth in the North



RABBIT FISH
Photo: Weller

Atlantic, this fish does not appear in any numbers in fishermen's catches and still more rarely reaches market. It is of no food value. It is notable for its large head and long whip-like tail and has a remarkable array of teeth, in arrangement and type not unlike those of the rabbit. There are at least two species, alike in habit and haunt and equally hideous in appearance.

Scientific Name. *Chimera monstrosa*

RABELAIS, *rab' leh*, FRANÇOIS (about 1490-1553). A French humorist and satirist. His most celebrated work, *Gargantua and Pantagruel*, relates the adventures of Gargantua, a giant with an enormous appetite, whose gluttony had made him notorious, and the amazing deeds of Pantagruel, the "king of drunkards." The work is a mingling of pure banter and keen and witty ridicule of politics, the Church, and education as they existed in the author's day. The coarseness of humour which is a feature of his work is part of the literary convention of the age.

Rabelais was by turns priest, physician, and story-teller. He was born at Chinon, the

son of an apothecary, and was educated in the monastery schools. He joined the Franciscan Order

and became a priest, but his ardent study of the Hebrew, Arabic, and Greek and Roman classics offended his brother friars, and he left them and entered an abbey of the Benedictines; later he left this in turn.

In 1530 he began the study of medicine at Montpellier, where, in 1537, he was granted a doctor's degree. In the meantime, he was appointed head physician of the great charity hospital at Lyons, a position which he held until about 1539. Shortly before his death, he served as curate in the parish of Meudon.

RABIES, *ray' be eez*. See HYDROPHOBIA.

RACCOON, *rak koon'*. The common name of a genus of small animals related to the bears. The raccoons are found in the New World, though a related genus occurs in the Himalayas. The common raccoon is about 32 in. long from nose to end of tail, and weighs from 20 to 25 lb. The stout body is covered with long, coarse hair, which is



RABELAIS
Photo: Brown Bros



RACCOONS
Photo: Wide World

greyish and black-tipped. The tail is bushy and greyish-white, with alternate rings of

black and white. These animals are famous tree-climbers, having long legs and strong claws. Raccoons have very catholic tastes and will eat anything from frogs to maize. They wash their food before eating it, and are fond of paddling in water. From three to six young are born at one time, usually in April or May. They are blind and helpless when born.

The *agouara*, or crab-eating raccoon, is found in South America.

The raccoon is hunted for its fur, which is often used for coat collars and cuffs. In cold climates the raccoon hibernates during the coldest period of the year.

Scientific Names. Raccoons belong to the family *Procyonidae*. The common raccoon is *Procyon lotor*; the *agouara* is *P. cancrivorus*.

RACEME, *racem*'. In botany, a type of flower cluster in which the flowers are borne on short, branching stems, or *pedicels*, on an elongated axis, or *peduncle*. There is no definite number of flowers, because the blooms appear as the axis lengthens, and the latter is not ended by a terminal blossom. Such a form of flowering is called *indeterminate inflorescence* (see INFLORESCENCE). The pedicels are borne in the axils of small modified leaves, called *bracts*. The red currant and hly-of-the-valley have *racemose* flower clusters.

RACES OF MAN. Mankind belongs to one mammalian grouping, genus *Homo*, distinguishable from all other anthropoids. All existing human beings also probably belong to one division of this genus, i.e. to one species, *Homo sapiens*. The other types, such as *Pithecanthropus*, *Sinanthropus*, etc., have long become extinct, being found only in fossil form.

Since it is probable that we have all descended from a common ancestor, our physical characteristics are largely similar, but there are many minor and obvious differences. Everyone can recognize contrasts in colour, hair, stature, etc. Indeed, these divergences may often lead to such prejudice, as on the colour question, that more fundamental similarities are overlooked. The science of measuring these structural and functional differences is only in its infancy, but some data have become popular, and may even be useful.

1. **Head Form.** The cephalic index is the ratio of the greatest breadth to the greatest length. Taking the latter as 100, skulls with a breadth below 75 are termed long (dolicocephalic), between 75 and 80 medium (mesocephalic), and above 80 broad (brachycephalic). Cranial capacity is also measured, but its relation to intelligence is obscure. But these measurements are of value in relation to the problem of inheritance, and

thus assist in diagnosing descent. It is important to note that the figures alone may be misleading because, for example, two heads may be equally rated brachycephalic, but one may be flattened at the back and the other bulging at the sides, different parts of the brain having expanded to produce the same measurement.

2. **Facial Angle.** In human evolution the tendency has been for the lower part of the face to recede, thus becoming less snout-like. This can be measured. If the lower part tends to project, it is called prognathous; if not, orthognathous.

3. **Nasal Index.** This is the ratio of the length of the nose to the breadth of the nostrils. Less than 47, a nose is thin (leptorrhine); more than 51, it is broad (platyrrhine); between 47 and 51, it is medium (mesorrhine). This feature may be related to climatic factors in areas of characterization; hence platyrrhine predominates in hot moist climates.

4. **Lips.** They may be thin, or everted and therefore thick.

5. **Colour.** This varies from black and dark chocolate to extreme bloneness. The yellow of the adult Mongoloid may be an intermediate stabilization.

6. **Hair.** Hair colour varies from black to brown and flaxen, but does not necessarily vary with skin colour—yellow-skinned people have black hair, most Europeans are dark haired. (Red hair is a biological sport.) Hair form varies from straight to wavy and even frizzy. This is dependent on the shape of the cross-section, which ranges from round to extremely oval. Peoples differ also in the degree of hairiness, body hair being extremely rare with Negroid and Mongoloid, but common in Europe.

7. **Stature.** All humans have an erect posture, but extinct types were not so upright. There is a great variety in height. See PYGMIES.

8. **Blood.** Human blood can be classified in four groups according to the possibilities of agglutination. It is salutary to note that this test cuts across most popular race theories and divisions.

9. **Functional Tests.** These, including tests of intelligence, are not advanced enough to yield diagnostic results. It is unfortunate that we have so often condemned our neighbours on this score without any objective proofs.

Variation exists therefore, and is beginning to be measured. On this basis, many attempts have been made to classify existing peoples into *sub-species*, or Races. Deniker, for example, made out six main groups according to the degree of curvature of the hair and partly to the colour of the eye.



AUSTRALOID TYPE
Men of the Veddah tribe
Photo Mansell

These he subdivided according to the colour of the skin, and then proceeded by further subdivision to twenty-nine "races." But, as critics have pointed out, this is a scholastic exercise rather than a genealogical classification. It is possible, however, to recognize the following factors. If all present peoples have descended from a common ancestor, then man's biological history must

include (1) his spread from the earliest cradle area, (2) those periods of segregation with their consequent development of diverging physical traits, and the differential retention of characters once common to all. This has led to a range of differences, establishing the main groupings of inheritable features. Again, (3), these peoples have come in contact with one another in varying degree, and



NEGROID TYPES
(Left) Wakamba (East African tribe) woman and baby. (Centre) Solomon Islander.
(Right) Woman of the Fiji Islands.

Photos Cherry Kearton; Mansell

the result is often to produce a relatively stable type. At present, therefore, we must hope that in the near future a sound working classification will be based on the more complete distributional evidence of the frequencies with which the inherited characters specified above occur among human beings. Provisionally, it is possible to assume that some types with certain distinguishing combinations of characters are relatively stable, and to arrive at a broad classification of six main groups, races or sub-species.

1. **Australoid.** Scattered in small numbers and in many localized forms from Southern India through Indonesia and Melanesia to their main concentration in Australia, are peoples with wavy black hair, much body hair, noses platyrrhine, heads dolicocephalic and of small cranial capacity (below 1300 c.c.), prominent brow ridges, jaws projecting, skin colour black. In some respects they are the least specialized of existing types, i.e. more like our primitive common ancestor. But their thick lips and wavy hair are not primitive. See **NEGROID**; **PYGMIES**.

2. **Negroid.** Peoples of this type have far-reaching physical influence in varying degrees from Portugal to the Pacific Easter Island, and since the sixteenth century in Central and North America. Their main branches are in Melanesia, and Africa, south of the Sahara. The probably diagnostic characters are dark hair of extreme oval section, therefore frizzy and often tight "peppercorn" curls, brown skins, absence of body hair, everted lips, nostrils distended, heads long, foreheads steep and bulbous, eyebrow ridges very slight, cranial capacity around 1400 c.c. The bones are slender and more dense than those of other races, depending for their strength on their ivory-like texture. There is much variation in stature and even in colour—the South African Bushman has a yellowish skin. The mixture of highly specialized features such as hairlessness, everted lips and slight eyebrow ridges with more primitive ones like colour, projecting lower half of face and distended nostrils, illustrates the inadequacy of the popular European prejudice concerning the Negroid. See **NEGRO**.

3. **Mongoloid.** Peoples of Mongoloid types extend from North-eastern Europe throughout most of Asia (except the South-west and India) and the whole of America. Factors of racial admixture exist in every branch of this race, which includes the Tundra peoples, the Chinese, the Mongols, the Japanese, the Red Indians, and other groupings. The common feature is the distinctive straight black hair, and skin colour is usually yellow. The bulk have broad heads, rather flat faces and prominent cheek-

bones. A frequent character is the epicanthic fold—the upper eyelid extending across the inner canthus, or corner of the eye, to form a fold with the side of the nose. This gives the slit-like appearance to the eye. Cranial capacity is possibly above 1500 c.c. It is important to distinguish the Mongol from the Turki people of Central and Western Asia. The Turki have full beards, are extremely hairy, whilst the Mongol is glabrous. The hair is wavy in the Turki, straight in



NORDIC TYPE

Norwegian woman and child of the Hardanger district in national costume
Photo: Norwegian State Railways

the Mongol. The Turki face is prominent, the Mongol's flat, etc. Thus the Asiatic influence in South-eastern Europe and Hungary is not Mongol, as is commonly supposed. The Japanese are extremely mixed, though they share the straight black hair, etc., they are often very white in skin colour, and usually very short of stature, legs especially being stumpy. The Malay race has mainly Mongoloid characteristics.

There remain the fair-skinned races, often grouped as European, the Mediterranean, Nordic, and Alpine.

4. **Mediterranean.** This type is so called because it encircles the Mediterranean, but it extends from the West of Scotland, Ireland, and Wales to the Far East, especially India. It also stretches around the Sahara, where it is often called Hamite, and has filtered down into Central Africa. The important

characters are: long heads, symmetrical and narrow faces, eyes and complexion dark, medium stature.

5. Nordic. Until the rapid expansion of Europeans in recent times, the bulk of this type were confined to Northern Europe. It



ALPINE AND MONGOLOID TYPES
An Italian from the Tyrol (left) and a Chinese
mandarin.

Photos: Fox

is distinguishable by the extreme fairness of the skin and usually the hair. Heads are long, faces raw-boned, stature tall.

6. Alpine. These types occupy the Russian plains, and extend into France across Central Europe. They are the dominant type in Bavaria and Poland. Farther East, the Turki peoples of East and Central Asia, and even the hairy Amu of North Japan, represent varieties of this race. Common features are the very broad head and the abundant hair. Hair is usually brown. Stature is small.

All these sub-species have in common the relative paleness that gives them the name "white." This applies chiefly to the skin, and also to eye colour to some extent. Cranial capacity, too, averages a little below 1500 c.c.

It is probable that these six main types do not represent "pure" races, but are the relatively stable results of segregation and intermixture. It is the combination of certain characteristics, not the individual character itself, which permits of such classification. Since peoples have usually moved over wide areas, they have come to represent some localized combination of many traits, permitting (on Mendelian principles) of much individual differences among its members. Britain is a good example of

this. Asiatic India combines in varying localizations all the six races, one striking example being the handsome Mediterranean features linked to a brown skin colour.

It should be obvious that the term race should have only a biological significance. It should not be confused with any cultural habit, i.e. language, religion, clothes, table-manners, industries, way of life, etc. These things are all capable of being adopted or rejected without a change of hair form or skin colour. Unfortunate examples of this confusion are the use of Aryan, Hamitic, Semitic as racial terms, whereas they refer properly to languages. There is no Semitic race—the Jews belong chiefly to the Alpine, but vary considerably according to their place of settlement. Race and nation are also distinct: the nation is a political grouping, and its citizens are usually mixed in physical type. In Germany, for example, there is a majority of Alpine, with some Nordic admixture. Finally, it is impossible to correlate race and civilization. There is no reason to suppose that the man with a spear and loincloth is inferior or superior physically to him in bowler hat and tailored suit. Neither has been studied with sufficient objectivity. See ANTHROPOLOGY.

RACHEL. The favourite wife of Jacob. In order to win her he was compelled to serve her father Laban for seven years. At the end of this time he was offered Leah in her stead, and he had to serve Laban seven more years to obtain Rachel. Rachel's



TOMB OF RACHEL, ON THE BETHLEHEM ROAD

Photo: U. & U.

elder son was Joseph, beloved above his brethren; her younger son was Benjamin. After the birth of Benjamin, Rachel died. She was considered the tribal mother of the northern tribes of Israel. See BENJAMIN, JACOB; JOSEPH.

RACHMANINOV, *rak mahn' in ov*, SERGEI (born 1873). A Russian composer and pianist, born at Novgorod (Gorky) of noble parentage. At the age of nine, he began his musical training at the St. Petersburg (now



RACHMANINOV
Photo Topical

Leningrad) Conservatorium. In 1885, having been transferred to the Moscow Conservatorium, he came under the influence of Tchaikovsky, Arensky, and Scriabine.

Rachmaninov's brilliance as a pianist is especially revealed when playing his own compositions. These include the famous *Prelude in C Sharp Minor*, which is the most popular of his works. Other works

include *The Elegiac Trio* for piano, violin, and violoncello, composed in memory of Tchaikovsky; the symphonic poem, *The Island of Death*; *The Bells*, based on Edgar Allan Poe's poem, *Spring*, for chorus and orchestra, and two one-act operas, *The Lamentable Knight* and *Francesca da Rimini*.

RACINE, *ras seen'*, JEAN BAPTISTE (1639-1699). Writer of French poetic drama. He was pre-eminently a tragedian, and the pre-

sentation, in 1667, of *Andromaque*, the first of his seven masterpieces of tragedy, was an event of great moment in the history of the French drama. Racine was born at La Ferté-Milon, and received a good education, notably from the Jansenist com-



JEAN RACINE
Photo Mansell

munity at Port Royal under whom he studied the Greek classics. In 1662 he settled in Paris, and became a poet of the fashionable element. At the same time he formed friendships with Boileau, Molière, and other notables in the literary world.

Racine was a poet of the cultured and fastidious; he never appealed to the masses.

The series of great tragedies, *Andromaque*,

Britannicus, *Bérénice*, *Bajazet*, *Mithridate*, *Iphigénie*, and *Phèdre*, were produced between 1667 and 1677. *Esther* and *Athalie*, his two Biblical dramatic poems, were written several years afterward.

RACK. An ancient instrument of torture, used to extort confessions from criminals and heretics. It was an oblong wooden frame with rollers on each end. Bound on this frame, the victim had questions put to him; if he refused to answer, the rollers were gradually turned by means of levers, stretching the victim until the joints became dislocated.

The rack was used by the Romans, especially for torture of Christians, and was frequently employed during the Inquisition. Its use was introduced into England in 1447, but except during the reign of Elizabeth was not used to any extent. In 1628 its legality was contested, and the use of the instrument declined.

RACKHAM, ARTHUR (born 1867). Artist. He was educated at the City of London School and the Lambeth School of Art. To a wide public he is known for his published illustrations of *Rip Van Winkle*, 1905, *Peter Pan*, 1906, *Alice In Wonderland*, 1907, Wagner's *Ring of the Nibelung*, 1910-11; *Aesop's Fables*, 1912, Poe's *Tales of Mystery*, 1935, and other works.

RACQUETS. A game which appears to have grown out of fives and real tennis, it was little known before the nineteenth century, and in its early days it was played in open courts, not infrequently formed by the walls of debtors' prisons or adjoining taverns. The Public Schools Challenge Cup was first played for in 1868, when it was won by Eton, but it was not until twenty years later that the amateur championship was instituted.

For a long time the game had no set code of laws, in 1891, however, Mr. Julian Marshall and others formulated a code which, though later modified, is in the main that in use to day.

With a small hard ball and a racquet, somewhat long-handled in proportion to the area of the head, the game, which can be a single or a double, is played in a court of four walls with sometimes a roof. The front wall is marked off with two lines, the higher being the service line, over which the ball, struck by the server, who stands with at least one foot in the service box, must hit. The non-server stands in or near the adjacent court.

The lower, or play line (a board), prescribes the area above which all returns, to be good, must be struck. The object now is, when A serves correctly against the front wall, without the ball first touching any

other part of the court, for B to return the ball, no matter off which of the walls it may have rebounded. If he fails, A scores a point. If A fails to serve two successive balls correctly he loses the service. Fifteen points constitute a game.

RADIATION. See HEAT; LIGHT; QUANTUM THEORY; ROENTGEN RAYS, ULTRA-VIOLET RAYS; COSMIC RAYS, etc.

RADIATOR. See HEATING AND VENTILATING.

RADICAL. In chemistry, two or more atoms forming a group which is capable of entering into a series of compounds without undergoing change.

RADICALISM. *rad' ik al iz'm* A term applied to the principles held by those who are opposed to conservative thought and action. It has been used in political terminology in England since the early part of the nineteenth century, but radicalism as a movement in English politics had its origin as early as 1769, in an effort to liberalize the House of Commons. For two or three generations before the decline of the Liberal Party it signified the left-wing element in that party. To-day, the Labour and Liberal parties represent the radical element in English politics. In the United States Senate, the term "radical" is often applied to the progressives, or insurgents, who have been in opposition to the regular Republicans through several administrations. See POLITICS.

RADIOACTIVITY. The property possessed by certain metals (or by their compounds) which causes them to emit rays, capable of penetrating opaque articles. In 1896 Henri Becquerel, a French scientist, discovered that the salts of uranium give off radiations that affect a photographic plate. The rays were named *Becquerel rays*, and the power of emitting them was called *radioactivity*. Two years later, Professor and Madame Curie announced their epoch-making discovery of an elementary substance which they found in pitchblende. The new element was named *radium* (which see).

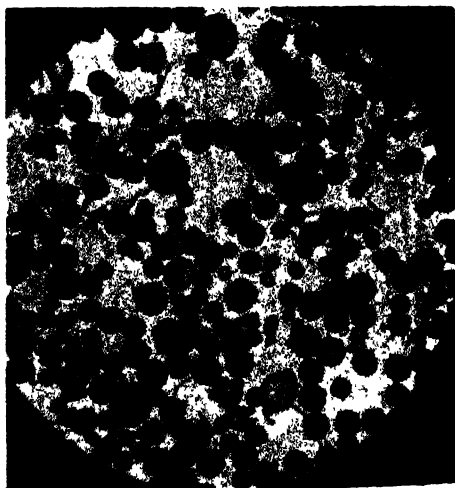
With the development of modern chemistry, it became an accepted belief that one element cannot be changed into another, because, according to the older theory, elements are composed of one kind of atom, and atoms are indivisible. Investigation of radioactivity has disproved this theory. Scientists now tell us that atoms in radioactive substances are constantly breaking up, and in the process, the disintegrating element changes into a different one. Radium is the offspring, so to speak, of uranium; it is the sixth product in a long process of disintegration, lasting millions of years, a process that has been traced as far down as

lead. There is another series in which the parent element is thorium, and a third series derived from actinium. See CHEMISTRY.

Three types of rays are emitted by radioactive substances, though not all of them are projected by every such substance. These rays have been named *alpha*, *beta* and *gamma*. The alpha rays are positively charged atoms of helium gas, which move with an average speed of about one-fifteenth that of light, or 12,000 miles per second. They have low penetrating power. Beta rays are negatively charged electrons and are identical with cathode rays. Their velocities vary from about one-tenth to nearly that of light, and they are capable of penetrating three millimetres of aluminium. The gamma rays have practically the speed of light, or 186,300 miles per second, in round numbers. The gamma emanations are not particles of matter, but are electro-magnetic pulsations like X-rays, though of shorter wave-lengths. They have high penetrating power, and have been known to pass through twenty centimetres of lead. The only known radiations of shorter wave-length are the so-called *cosmic rays*, of intense penetrating power, generated in space. See COSMIC RAYS.

RADIO COMMUNICATION. See WIRELESS.

RADIOLARIA, *ray di o lair' ia.* A class of minute one-celled organisms found in the warm seas. They belong to the Protozoan



MICROPHOTO OF RADIOLARIA BARBADOSIS
Photo: H. E. Taylor

tozoan order Rhizopoda (see PROTOZOA). Radiolarians have the body covered with a tiny shell of silica. After a radiolarian dies, its shell sinks to the ocean floor, and the

accumulations of countless shells have caused the formation of thick layers of ooze in many parts of the sea. Fossil remains of these shells constitute a large part of the rock known as *tripoli*, and of *Barbados earth*, both of which are used as polishing powder. The name of the order has reference to fine threads of protoplasm which, projecting from the cell body through apertures in the shell, radiate in all directions.

RADISH. A garden vegetable cultivated for the edible root, either carrot-shaped or round. The radish is related to the mustard. Radish seeds may be sown in very early spring, if a sheltered spot is chosen, in well prepared rich soil, about an inch below the surface. Radishes should not be allowed to mature closer than one in each 2 in. of the row, and should be ready to eat about three weeks after sowing.

RADIUM. A very rare and precious element, specially important for the intense radiations it continuously emits; symbol, *Ra*, atomic weight, 226 (approx.); atomic number, 88

In 1898 Professor and Madame Curie and G. Bémont of Paris announced that they had succeeded in extracting from pitchblende a substance associated with barium which, weight for weight, gave off radiations far more intense than the rays from uranium, discovered by Becquerel in 1896. They named the new substance radium, and by working with a ton of residues from pitchblende, they finally separated a few grains of nearly pure radium chloride, which, weight for weight, emitted radiations fully a million times as intense as the rays from uranium.

All minerals and ores containing uranium contain radium. In general, the ratio of radium to uranium is the same in natural minerals, namely, one part by weight of radium to 3,000,000 parts uranium. In a ton of high grade ore, 50 per cent uranium, only 150 milligrams of radium ($\frac{1}{4}$ grains, or $\frac{1}{200}$ oz.) are present. The principal uranium bearing minerals are pitchblende (uraninite), carnotite, and autunite. In pitchblende, uranium occurs as the oxide, more or less pure, the ore is found principally in Belgian Congo, Czechoslovakia, and Northern Canada (Great Bear Lake region). In carnotite, vanadium is associated with uranium. This ore is of low grade, occurring in U.S.A. and Australia. Autunite, a phosphate of uranium, is found in Portugal. To-day radium is produced mainly from the high-grade pitchblende deposits in the Belgian Congo and Canada, at a price of about \$15 per milligram of the element.

Radium is generally sold in the form of the chloride or the bromide, mixed, when impure, with the barium salt.

Chemical Properties. Radium is a silver-white metallic element, whose compounds are obtained by a process of fractional crystallization (see below). In 1910 Madame Curie succeeded in isolating a tiny globule of the metal by electrolysis.

Radium behaves chemically exactly as would be expected of an element belonging to the alkaline earth family, which includes also calcium, strontium, and barium. Barium resembles it most closely, but barium does not emit radiations. Since the study of radium centres upon the radiations that it emits, it is not surprising that its chemical behaviour has not aroused much interest



RADIUM-BOMB TREATMENT AT UNIVERSITY
COLLEGE HOSPITAL
Photo Photopress

The atomic weight of radium, however, has been accurately determined by Honigschmid and found to be 225.97. The valence is 2, and the formula for the bromide is $RaBr_2$. The common compounds of radium are white solids, somewhat resembling ordinary salt.

The Disintegration of Radium. Radioactive elements, as described in the article on RADIOACTIVITY (which see), emit radiations. The alpha ray, or alpha particle, emitted by radium, has been found to be a material particle—an atom—the helium nucleus—which is expelled from the centre of the radium atom with the almost incredible velocity of 12,000 miles per second (A rifle bullet travels half a mile per second). The alpha particle is one of the most powerful agents in the service of science. Not all atoms in a sample of radium break up at the same instant of time; only about one in 100,000,000,000 atoms breaks up each second, yet one gram of radium expels 43,000,000,000 alpha particles each second.

Radium disintegrates at the same rate at the temperature of liquid air, and at the temperature of the electric arc. Radium atoms break up at the same rate in the

chloride as in the sulphate. One half of a given sample of radium changes into new products in 1600 years; in the course of the following period of 1600 years, one half of the remainder of the sample disintegrates, and during the next period of 1600 years, one half of the remaining atoms disintegrate, and so on.

How is it then that old uranium minerals still contain radium? The answer is that uranium too is a radioactive element. Some of its atoms disintegrate, though the rate of disintegration is very much slower among uranium atoms than in the radium structure. About 4,500,000,000 years must pass by for one half of the atoms in a sample of uranium to be transformed into new products. While uranium atoms, in breaking up, do not form radium directly as a first offspring, nevertheless, radium is a lineal descendant of uranium, it being the sixth generation of atoms removed from uranium. Radium is just one of the fifteen members of the uranium series of radioactive elements, the end member being stable "radium lead." While some atoms of the radium contained in natural uranium minerals are decaying, the equilibrium ratio of about 3,000,000 uranium atoms to one atom of radium remains quite constant, new atoms of radium being supplied by the parent stock, uranium, as fast as the radium atoms beget new offspring. Since alpha particles, which are charged atoms of helium gas, are continually being produced by the disintegration of the radioactive elements such as uranium and radium, the amount of helium in a rock tends to increase with the course of time. By measuring this amount of helium, geologists are able to tell the age of mineral deposits.

Freshly prepared radium emits hardly any radiations which can penetrate glass. The alpha rays are stopped by a sheet of paper. In the course of a month, the disintegration products, radon, radium A, radium B, and radium C, grow and reach equilibrium. The penetrating beta rays of radium come from Ra B, and the still more penetrating gamma rays come from Ra C.

Radium Products. The name "radium," in its broader meaning, includes, besides radium the products radon, Ra A, Ra B, and Ra C. Radium and its four products give off heat at the rate of 130 calories per hour per gramme. A trace of radium mixed with phosphorescent zinc sulphide and made up into a paint is used in making luminous watch dials. Each alpha ray from radium produces a microscopic flash of light, and these blend into a faint greenish glow.

Radium in the Treatment of Disease. The beta and gamma rays make radium valuable in the treatment of cancer, tumours,

certain skin diseases, and growths. When so used, radium or its product, radon, does not come in direct contact with the affected tissue, but is contained in sealed glass or metal tubes.

Frequently these glass tubes contain only radon and its disintegration products. As radium is continually breaking up to give radon, a single supply of radium will yield a continual supply of fresh radioactive tubes for medical use.

Severe burns, much the same in character as X-ray burns, sometimes result from careless exposure to the intense radiations from radium. The inflammation appears only several days after exposure of the skin, and the burns often give rise to sores which are difficult to heal.

Preparation of Radium. Radium chloride can easily be separated from pitchblende in the form of a mixture with barium chloride. A hot saturated solution of barium-radium chloride is prepared; upon cooling, about one half of the dissolved chloride crystallizes out, and about 80 per cent of the radium is now present in these crystals. The mother liquor is then poured off. The crystals are dissolved in hot water, and the solution again cooled. By repeating this operation a number of times, crystals of pure radium chloride are finally obtained, when the metal can be separated by electrolysis.

Refined radium is generally kept in small glass tubes enclosed in heavy-walled tubes of lead.

RADIUS. In anatomy, the large bone of the forearm. See ARM, HICKS.

RADNORSHIRE. A border county of Wales, with an area of 301,195 acres and a population (1931) of 21,314.

General Physical Features and Scenery. The landscape of Radnorshire has been famous for its rugged beauty from the earliest times, and the growth of towns such as New Radnor and Llandrindod owes much to this advantage. Mountainous and wild, with vast areas of high moorland, Radnor yet has river valleys which are comparable in beauty with those of any in Wales. The highest ground is to the east of the centre where Radnor Forest attains a height of 2166 ft. and contains numerous peaks exceeding 1800 ft. Extending north and north-west from this central upland mass are two long ranges, broken by numerous mountain torrents. Beacon Hill and Black Mountain in the north and Llandelo Hill and Clyro Hill in the south are among the outstanding peaks. Westward a chain of beacons extends parallel with the Valley of the Wye. In the extreme west is another high tableland in which the Trunau range reaches a height of 1760 ft. The remainder of the

county, apart from the river valleys (see below), is a succession of tumbled hills, lofty tablelands and deep-cleft hollows.

The typical scenery of the high ground comprises heather moors on the high parts, and short turf on the lower slopes of the hills, where thousands of head of sheep graze at large. Peat bogs are of frequent occurrence, and timber is almost entirely lacking on the hills, in contrast with the dense woods and thick undergrowth of the Wye Valley. The landscape is further diversified in the west by the reservoirs of the Birmingham Corporation. The remainder of the county may be described as a combination of rounded grass-covered hills, and cultivated valleys.

The principal river is the Wye, which for most of its course marks the western and southern boundary. It rises in Plynlimon, just over the border of Montgomeryshire, and flows generally south through Rhayader, Builth, then north-eastward to Hay. Noted alike for its salmon fishing and its scenery, the Wye is most beautiful above Rhayader, where it has the character of a mountain torrent, and below Builth, where it flows into a narrow gorge between hills clad in hanging woods. But the whole course is attractive, and near Hay, extremely fertile. Its tributaries, with one exception, are insignificant. The Llan rises near the boundary between Cardigan and Montgomery and flows south, but the greater part of its course has been dammed to form reservoirs, only a slight stream remaining to flow into the Wye near Rhayader. The Ithon, also, is of some size and flows south from the central uplands to the Wye, which it reaches half-way between Builth and Rhayader. The remainder of the county is drained by tributaries of the Severn flowing east, the most important of these are the Leme, the Arrow and the Lug.

History and Antiquities. The history of Radnor is the history of the other counties which lie within the Welsh Marches—a long tale of strife and discord until the Act of Union in 1536. Many implements dating from Neolithic and Palaeolithic times have been discovered. Of the monuments still standing *in situ*, the Four Stones in the Vale of Radnor is one of the most conspicuous. Stone circles are also numerous. One of the largest round barrows in the country is Bedd-y-gre. Prehistoric camps are found on several hill-tops. The Romans penetrated extensively into the county, and Roman roads are still used.

The remains of Offa's Dyke run through the county, and generally it may be said that the portions of the county lying to the west of this remained Welsh, while those lying to the east came under Saxon influence.

Radnor was in the thick of the resistance to the conquering Normans, and later suffered the cruelty and oppression of the Norman Marcher Lords; but after its formation into a shire in 1536, its history has been in the main peaceful and one of agricultural development.

The medieval antiquities consist chiefly of ruined castles. None is entire, but there are large fragments of the castle of Dinbod and of Colwyn Castle of the thirteenth century, while only the bare earthworks remain



IN LLAN VALLEY, RADNORSHIRE
Photo: Taylor

of the oldest, that of New Radnor, founded in the eleventh century.

Resources. In spite of the mountainous character of the county, it may be said that every acre worthy of cultivation is cultivated. Farmland altogether amounts to about half the total area but of this fully three-quarters is devoted to permanent pasture. Sheep are bred on the lower slopes of the moors, as are also ponies.

Minerals are few and unimportant, and, at present, activity in this direction is confined to a number of small stone quarries. Small industries connected with food products and wool have arisen, but never on a large scale.

Chief Towns. The county town is *Presleign*, with an area of 2094 acres and a population in 1931 of 1102. It is situated in the

extreme east of the county in the valley of the Lug and is an important market town.

Knighton. An Urban District with an area of 3664 acres and a population in 1931 of 1836. This is a market town situated on the River Teme in the north-east of the county.

Llandrindod Wells. An Urban District with an area of 1509 acres and a population of 2925 in 1931; although, compared with 1921 census, this shows a fall of 36 per cent, it remains the largest town of the county. Its rise has been due entirely to the value of its mineral springs, which have converted it into a popular health resort.

New Radnor. A Rural District with a population of 2573 in 1931. The town, which to-day has a population of less than 500, is one of the most ancient places in the county and is mentioned in Domesday. It was at one time the county town.

RAEBURN, SIR HENRY (1750-1823). A Scottish painter in water-colour and oils, contemporary with Sir Joshua Reynolds. He was born at Stockbridge near Edinburgh and at first was apprenticed to a goldsmith, but becoming acquainted with David Martin, a portrait painter, began to study art and commenced painting miniatures. Visiting London, he met Reynolds who advised him to study the Italian artists. Acting upon this advice, Raeburn visited Italy in 1785 and, after a stay of two years, returned to Edinburgh to take up portraiture. He soon achieved success, painting portraits of most of the people of importance in Scotland, his work showing a vigorous talent for characterization. In 1814 Raeburn was elected an Associate of the Royal Academy and an Academician a year later, and in 1822 he was knighted.

Raeburn's finest works are in the National Gallery at Edinburgh. At the Archer's Hall, Edinburgh, is his fine painting of Dr Nathaniel Spens, which many regard as his masterpiece.

RAETIA, *re'shia* A province of the ancient Roman Empire, corresponding to the modern districts of the Grisons in Switzerland and the greater part of the Tyrol. Although very mountainous, the valleys of Raetia produced excellent corn and wines, and it is said that Augustus drank Raetian wine in preference to all others. The province was inhabited by a warlike people, and they were not subdued until they were finally conquered by Drusus and Tiberius. The only town of any importance in the province was Tridentium (Trent).

RAFFIA. The fibre from the leafstalks of a palm tree (*Raphia ruffia*) which is found in abundance on the north-eastern coast of

Madagascar. The fibre is so pliable that it can be bent to any shape, and it readily takes the colour of a dye. Is used extensively in greenhouses as a wrapping to protect plants and young trees from bruises or cold, and to tie buds and grafts.

The ease with which useful and artistic products may be made from raffia has led to its use as a material for weaving in many schools.

RAFFLES, SIR T. (1781-1826). A British Colonial administrator in the Far East, who is chiefly remembered as the founder of Singapore (which see).

RAGGED ROBIN.

A perennial flower of the Pink family, also known as the Cuckoo flower. It may grow to a height of 3 ft., but more commonly reaches some 2 ft. only. Its name is derived from the somewhat ragged appearance of the five petals which are deeply cut so that each one is almost divided into four. The flowers, which are in small clusters, are rose-coloured. The stem is hairy at the bottom, but has a sticky feel toward the top, and near the flowers is slightly tinged with pink, as also is the calyx tube. It flowers in June and July in marshy damp ground.

Scientific Names. The ragged robin belongs to the *Prunellaceae* family and to the *Lychnis* or *Campion* division. Its *Lychnis flos-cuculi*.

RAGLAN, FIRST LORD (1788-1855). British Field-Marshal. He was the youngest son of the fifth Duke of Beaufort. He served in the Peninsular War, being aide-de-camp to Wellington, and was present at the battles of Vimiera, Busaco, and Badajos. At the Battle of Waterloo (1815), he was wounded



RAGGED ROBIN
Photo: F. J. H. S.



LORD RAGLAN
Photo: Mansell

and lost his right arm. He succeeded the Duke of Wellington as Commander-in-Chief, and on the outbreak of the Crimean War, two years later, he controlled operations. He led his army to victory at Alma (September, 1854) and at Balaklava and Inkerman in the following months, but misfortune dogged him at the Siege of Sevastopol during the disastrous winter of 1854-5. He was severely criticized for what was called mismanagement, but he was in reality a victim of circumstances. The army was quite unprepared to endure the cold and deprivation of the Russian winter, and Lord Raglan was badly supported from home.

RAGSTONE or **KENTISH RAG**. A rough, nodular, siliceous limestone found in the Hythe beds of the Lower Greensand of Kent. It is used locally as a road stone and for building purposes, and it has been burnt for lime. It contains an abundance of spicules of fossil sponges. A softer variety is sometimes known as "hassock."

RAGTIME. A term used of the earlier forms of what is now known as jazz (which see).

RAGWORT. A number of flowers somewhat similar in appearance have this name, and all are in the groundsel section of the daisy family. The common ragwort is a

masses and have an unpleasant odour, especially when bruised. The leaves are deeply lobed. Cattle will not eat the ragwort unless by mistake when in hay. The common ragwort (which flowers in waste ground and ill-kept pastures throughout the summer) is a perennial, but some other ragworts are annuals and others biennials.

Scientific Names. The common Ragwort is in the division *Senecio* of the family *Compositae* and is classed as *Senecio jacobaea*.

RAIKES, *rayks*, ROBERT (1735-1811) The founder of the Sunday school. He was born in Gloucester, where, from 1757 to 1802, he published a newspaper called the *Journal*. Rakes was a pioneer in the movement to better conditions in the prisons; his first Sunday school, opened in 1780, was designed to help the children of the poor. See **SUNDAY SCHOOLS**.

RAIL. A name originally used for two common British birds, distinguished as land- and water-rails, but now used gener-



RAGWORT
Photo. E. J. Hoshing

strikingly tall plant, sometimes over 4 ft. in height, with a tough ridged stem. Its flowers are bright-yellow with a large centre disk of florets and a number of narrow ray petals, which are rather more widely spaced than in a daisy. The blossoms are in dense flat



WATER RAIL FEEDING
Photo. E. J. Hoshing

ally for all the members of the rail family. They are both numerous and of world-wide distribution.

The land rail, or corn-crake, is a fairly common summer resident all over Britain, where it nests mainly in the long grass of open country. It seldom takes to the wing, but moves swiftly and quietly through the dense vegetation which it haunts. The loud rasping cry of the male is very characteristic.

The water-rail, as its name implies, is found in the neighbourhood of rivers, lakes, and swamps. It is a very shy bird and is present all the year round.

There are several other less common rails found in Britain.

Scientific Names. The rails belong to the family *Rallidae*. The land rail is *Oreoscoptes*, the water-rail is *Rallus aquaticus*.

RAILWAYS. It would often appear that the vast services performed by the railway are in danger of being overlooked. Without railways it would, even to-day, be all but

impossible to supply food and necessities economically to the aggregations of people in industrial communities.

British Columbia joined the Dominion of Canada in 1871, subject to the completion of a railway from the Atlantic to the Pacific to unite British Columbia with the older colonies of Quebec and Ontario. Had there been no railways, only those farmers situated near navigable waterways could have disposed profitably of produce in excess of family requirements in Australia, South Africa, Argentina, the United States and many other communities. The easy communication afforded by railways has been a vital factor in civilization.

Railway as a Machine. The most efficient means of land transport is the steel track. This consists of two parallel lines of rails, each, on British railways, of from 30 ft. to 90 ft. in length and weighing up to 100 lb. a yard, to carry the wheeled vehicles. The heavy pressure of the wheels—up to 20 tons to the square inch—of vehicles passing over the track is spread over a wide area through the medium of transverse wooden or steel sleepers, which, in this country, are 8 ft. 6 in. wide and spaced 21½ to the mile. The sleepers rest on ballast, usually of broken stone, porous to provide drainage. In Great Britain the steel rail is carried in a cast-iron chair, but in almost all other countries a flat-bottomed rail rests more or less directly on the sleeper. The greater ease of traction upon a railway as compared with a road—an effort of perhaps 10 lb. a ton is all that is needed to move a railway vehicle, compared with about 55 lb. a ton to move a road wagon—explains the early success of railways before the invention of the motor vehicle and of modern road surfaces.

It is the aim of the railway engineer, in the interests of speed and economy, to make the line as level as possible consistent with a low capital expenditure, hence much of our railway mileage is carried through cuttings and tunnels or upon embankments and viaducts.

Origin of Railways. The railway as we know it to-day originated with baulks of timber laid at coal mines in the Midlands and North of England to facilitate the passage of wagons from the mine to the nearest navigable water. The first railway engineer whose name has been handed down to posterity was Huntington Beaumont (1561–1621) who, at least as early as 1597, had a crude railway dealing with 500 tons of coal weekly at Bilborough, near Nottingham. During the next two hundred years mineral tramways were installed for any industrial purposes, the rail evolving to two cast-iron angle plates arranged thus:

The wagons had plain unflanged wheels, usually 5 ft. apart. To gain greater strength the edge rail was adopted, and the flanges transferred to the inside rims of the wheels. As the average thickness of the wheels was 1½ in., the 4 ft. 8½ in. gauge was thus obtained. Edge railways were not adopted generally until the era of steam.

The first public railway in the world, the Surrey Iron Railway, was authorized by an Act of Parliament in 1801. Opened in 1804, it connected Wandsworth with mills in the busy Wandle Valley and Croydon, and was part of a scheme, never completed, for providing a railed toll-road from London to Portsmouth. A considerable number of similar lines were authorized in the following years, some of which, such as that of the Oystermouth Railway or Tramroad Company—whose line was opened in 1807, and is now part of the Swansea and Mumbles Railway—survive to-day.

The first steam railway locomotive was built in 1804 by Richard Trevithick, but it was operated on the Penydyrenn Tramroad, laid with plates, and its comparatively heavy weight broke them. The first commercially successful application was the so-called Blenkinsop locomotive, designed and built by Matthew Murray (1765–1826) in 1812 for use on the 3½-mile long Middleton Colliery railway near Leeds. As it was not believed by the builder that smooth wheels could drive on smooth rails, the engine was driven by a toothed wheel engaging in a rack, or series of teeth, alongside one of the rails. These engines worked until 1835 but without the success which attended engines in which the blast of the exhaust steam was directed into the chimney to draw the fire.

Puffing Billy by Blackett and Hedderley was a locomotive on eight wheels put into service at Wylam in 1813; in the following year the first engine built by George Stephenson (1781–1848), *Blucher*, entered service at Killingworth Colliery. In his second engine he attached the connecting rods directly to crank-pins in the wheels, thereby removing a complication from which previous engines had suffered. It may be mentioned that steam traction was introduced in 1817 in Scotland on the first railway to be built in that country, the Kilmarnock and Troon, opened in 1817.

Railway schemes—frequently based on the greater ease with which animal power could draw loads upon rails—were produced by numerous engineers and business men during the next few years. Thomas Gray published, in 1820, *Observations on a General Iron Railway*, with suggestions for routes linking the principal cities; Rennie in 1825 propounded, among others, a scheme for a

London-Bristol railway (via Brighton, Southampton, Salisbury and Bath!); while throughout this period William James, sometimes referred to as the "father of railways," inspired projects which later matured into trunk routes, although the one with which he was most associated progressed only from Stratford-on-Avon to Moreton-in-the-Marsh en route to London.

Public Railways. The Stockton and Darlington Railway, promoted as a public toll-railway for coal haulage, and authorized by Parliament in 1825, brought steam locomotion and railways to general public attention. Mr. Edward Pease, of the Quaker coal-owning family, pressed the scheme, and secured from the directors

porated a boiler containing a large number of tubes to convey the hot gases from the firebox. It is now preserved in the Science Museum at South Kensington, along with a modern replica showing its original condition. The railway opened, with steam traction only, on 15th September, 1830. Its success was phenomenal; passenger traffic, which had been estimated at £10,000 a year, produced an income of £101,829 in the first twelve months.

Earlier in the year the first portion of what is now the Southern Railway, a line joining Canterbury and Whitstable, was opened. The second section, part of the London and Greenwich Railway, was opened in 1836, and was thus the first railway in



PADDINGTON STATION IN 1835

Photo G. W. R.

the opportunity of a fair trial for Stephenson's steam locomotive. At the opening on 27th September, 1825, this machine, the famous *Locomotion*, hauled 450 passengers and some 90 tons of coal and merchandise, the maximum speed attained being 15 m.p.h. For the time being, horse traction was used for passenger vehicles, steam being confined to mineral traffic. The locomotive foreman of this railway, Timothy Hackworth, in the next two years produced designs having most of the characteristics of the modern locomotive. The original route is now part of the London and North Eastern Railway.

The Act for the famous Liverpool and Manchester Railway (now incorporated in the London, Midland and Scottish system) was passed in 1826. Again animal or stationary engine traction was contemplated, although 30 miles separated the termini. Opposition finally brought about the celebrated Rainhill trials of 1829, when a £500 prize was offered for a locomotive fulfilling the company's conditions. This was won by the 4½-ton engine *Rocket*, designed and built by Stephenson, in which was incor-

porated a boiler containing a large number of tubes to convey the hot gases from the firebox. It is now preserved in the Science Museum at South Kensington, along with a modern replica showing its original condition. The railway opened, with steam traction only, on 15th September, 1830. Its success was phenomenal; passenger traffic, which had been estimated at £10,000 a year, produced an income of £101,829 in the first twelve months.

Earlier in the year the first portion of what is now the Southern Railway, a line joining Canterbury and Whitstable, was opened. The second section, part of the London and Greenwich Railway, was opened in 1836, and was thus the first railway in

London, although quickly followed by the first great trunk line, the London and Birmingham, which was opened from Euston to Boxmoor on 20th July, 1837. On 4th June of the following year the Great Western Railway authorized in 1835 made its debut. Brunel (1806-1859), the brilliant young engineer who planned its course from London to Bristol, visualized far higher speeds than had hitherto been attained, and chose a gauge of 7 ft. 6½ in. While certain advantages were apparent in early years, the difficulties of interchange for passengers, and more especially the exchange of freight traffic, brought about a gradual conversion of the Great Western Railway and its associates to 4 ft. 8½ in gauge. The death knell of the broad gauge was sounded in 1846 by the Government Gauge Commissioners, and thereafter the northward extension of the G.W.R. itself was carried out on standard gauge, mixed gauge was introduced to Paddington in 1861, the South Wales lines were completely converted by 1872, and the final phase was completed on 20th to 23rd May, 1892, when 171 miles stretching to Penzance were dealt with

Development of British Railways. It is possible here to review but briefly the further expansion of the British railway system. The first narrow-gauge railway, the Festiniog, with 1 ft. 11½ in. between the rails, opened in 1836. The London and Croydon Railway utilized the bed of the Croydon Canal, replacing the Forest Hill flight of 28 locks by an inclined plane, considered steep in 1839, rising one foot in one hundred. It was continued to Brighton in 1841 and proved that railways could be successful in other than industrial surroundings. Parliament, in its wisdom, considered that one railway outlet to the south of London would suffice, and the South Eastern Railway had to use the London and Croydon and London and Brighton metals to Redhill, and, as jointly-owned railways had not yet been conceived, part of the route was transferred to South Eastern ownership when that line opened. It reached Dover in 1844.

The London and Southampton Railway, forerunner of the London and South Western (now incorporated in the Southern Railway), was completed between 1838 and 1840. The Eastern Counties Railway, originally laid to the 5 ft. gauge, was opened from Shore-ditch as far as Romford on 18th June, 1839. The costly extension into Liverpool Street followed thirty-nine years later, the line having been amalgamated into the Great Eastern Railway (now L.N.E.R.) in 1862. The Midland Railway (constituent of the present L.M.S. Railway) was formed in 1844 by amalgamation of the North Midland, Birmingham and Derby Junction and Midland Counties Railways. In June, 1844, the first train ran from Euston to Gateshead, 303 miles, at an average of 37 m.p.h. In 1849 the High Level bridge was opened into Newcastle-on-Tyne, and in 1850 the first part of the Great Northern Railway was completed. This railway eventually joined King's Cross (London) by direct route with the North Eastern Railway, which had been constituted in 1854 by an amalgamation of a number of smaller undertakings. The Great Northern and North Eastern Railways are now amalgamated in the London and North Eastern Railway.

A Network of Lines. In the meantime, the bubble of the 1845 railway mania, in which railways had been proposed on all manner of competing routes, had burst. Two hundred and seventy-two Acts for new lines were passed in 1846, the year when the London and North Western Railway (a forerunner of the L.M.S.R.) was formed by a merger, similar consolidation gave birth in 1847 to the Lancashire and Yorkshire system (another constituent of the L.M.S.R.). The Midland Railway, which first obtained

access to London via the London and Birmingham Railway from Rugby, in 1857 was extended to Hitchin and operated its trains to King's Cross over the Great Northern Railway. This proving unsatisfactory, powers were obtained for a direct route from Bedford, and this was opened to St. Pancras in 1868. Seven years earlier the London, Chatham and Dover Railway, originally incorporated to extend the South Eastern Railway from Strood to Chatham and Canterbury, had entered London, the trains being run to Victoria.

The last railway to enter London was the Great Central (now part of the L.N.E.R.) which in 1845, with a line from Manchester to Sheffield through the Woodhead Tunnel under the Pennines, had at that time the world's longest railway tunnel (3 miles 13 yds.). In 1846 this railway was incorporated in the Manchester, Sheffield and Lincolnshire Railway. Its London extension, which justified the title Great Central, was made in conjunction with the Metropolitan, whose first section was opened in 1863 from Paddington (Bishop's Road) to Farringdon Street as the first underground railway in the world. It was extended into the country after the completion, with the aid of the Metropolitan District Railway, of the Inner Circle in 1884, reaching Pinner in 1885 and Aylesbury in 1892. The first Great Central train to London (Marylebone) ran on 15th March 1899. This railway has since used the Metropolitan between Quanton Road (just north of Aylesbury) and Harrow-on-the-Hill to gain access to the Metropolis. In consequence, this system of line was leased by the Metropolitan and Great Central Joint Committee, the partners to-day being the London Passenger Transport Board and the L.N.E.R.

Railway Supervision; Recent Amalgamations. The importance of railways was recognized one hundred years ago in many countries, and all development was carried out under State concessions or ownership. In Great Britain we have contented ourselves with stringent regulation, dating from the Regulation of Railways Act, 1844. Other legislation which may be cited includes the various Acts dealing with rates and charges, compulsory provision of continuous brakes on passenger trains (these are operated by vacuum on British steam trains, but by air pressure on electric trains and on the majority of the world's railways), and other safety devices. British railways were under the control of the Board of Trade until 1919, when the Ministry of Transport was formed.

In 1921 the railways, which had been operated as a national unit by an executive committee during the war period, were returned to company management, but



GROWTH OF THE RAILWAYS. I

1. Earliest known illustration of "The Rocket." 2. First railway engine to run from Cape Town, S. Africa; it was built in 1859. 3. The work of Marc Segurn, this locomotive was the first to be built in France. 4. "Locomotion" No. 1, built in 1825 for use on the Stockton and Darlington Railway. 5. Modern L.N.E.R. engine "Cock o' the North." 6. L.M.S.R. "Royal Scot" in Canada with giant Canadian Pacific engine "2810." 7. L.N.E.R. engine "Silver Link," leaving King's Cross Station with the first "Silver Jubilee" train in 1935. 8. Streamlined electric train in Denmark. 9. Trains with mail and first class carriages (top), and with second class carriages (below), on the Liverpool and Manchester Railway in 1831.

under an Act of that year the 121 operating companies constituting the principal systems in Great Britain were amalgamated in four companies on 1st January, 1923. These companies assumed the names indicated by their territory—Great Western, London and North Eastern, London Midland and Scottish, and Southern Railways.

On 1st July, 1933, the Metropolitan Railway and the London Underground group of lines, including the deep-level tube railways, were merged in the system of the London Passenger Transport Board. In the Irish Free State the railways were grouped in the Great Southern system in 1925, but in Northern Ireland there are arrangements between the individual companies and the Northern Ireland Road Transport Board, which operates all public road transport, under powers of 1935.

Railways in Scotland. In Scotland the Edinburgh and Glasgow Railway was opened in 1842. This line is now incorporated in the North British section of the London and North Eastern Railway. The Caledonian Railway (now London Midland and Scottish) was opened from Carlisle to Edinburgh and Glasgow in 1848, two years after the North British Railway had joined Berwick and Edinburgh. The "Waverley Route" from Edinburgh to Carlisle was not completed until 1862, but the Glasgow and South Western route from Carlisle to Glasgow was finished in 1850. The railway route to Aberdeen was also opened in that year, Inverness being reached in 1858 by the Great North of Scotland and Inverness and Nairn Railways. The latter was amalgamated with other small undertakings into the Highland Railway (now L.M.S.R.) in 1865. Wick and Thurso in the extreme north were served by the Sutherland and Caithness Railway in 1874.

In Ireland. In Ireland the first railway was the Dublin and Kingstown, opened in 1834. The Ulster Railway, of which the first portion was opened in 1839, was on the 6 ft. 2 in. gauge, but a Royal Commission established the Irish standard gauge as 5 ft. 3 in. The sparse population rendered railway development slower than in England and Wales, or even than in Scotland, and much of it was carried out with Government assistance. The first portion of the connection between Dublin and Cork was not authorized until 1844. Much of the mileage constructed under Government guarantee in the late Victorian period is on the 3 ft. gauge, in order to provide railway facilities at the least possible cost.

Engineering Works. Many of the most important among railway engineering works have resulted from the need of shorter

routes. To give the North British Railway improved connections over its own lines between Edinburgh, Dundee and Aberdeen, the Forth and Tay Bridges were planned. The latter was first opened on 1st June, 1878, and collapsed on 28th December, 1879, in a heavy gale, while a train was crossing. Work on a similar design for the Forth Bridge was then stopped, and not resumed until an improved design had been obtained. The second Tay Bridge, over two miles in length and consisting of 85 lattice-girder spans, was opened in 1887. The Forth Bridge was begun in 1883 and was completed in 1890; it is $1\frac{1}{4}$ miles long, and incorporates two enormous central spans of 1710 ft. each, the projection arms of the cantilevers being 681 ft. 9 in. in length.

The Severn Tunnel, 4 miles 624 yds. long, was opened in 1886 after thirteen years of strenuous labour, prolonged by the tapping of a fresh-water spring in 1879 and incursion of the tide and spring water in 1883.

To this day an average of 20,000,000 gallons is pumped out daily.

The Great Western Railway shortened many of its routes early in this century, the route to South Wales being cut by a further 10 miles in 1903 by the Badminton line, which includes a tunnel of 4444 yds. at Chipping Sodbury, and that to Plymouth by 20½ miles in 1906. Four years later 18½ miles were lopped from the London-Birmingham route by the new line by way of Beaconsfield, High Wycombe and Bicester. The magnificent bridge over the Tamar at Saltash, designed by Brunel and opened by the Prince Consort in 1859, made the railway gateway into Cornwall. One of the most famous British railway bridges enabled much faster journeys to Ireland—it is the Britannia tubular bridge across the Menai Strait, connecting Wales and Anglesey, which was opened in 1850. It consists of cast-iron tubes, 15 ft. wide by 23 ft. high, the principal ones being 460 ft. long, through which the trains run.

Locomotives. The development of motive power has been phenomenal. It is a far cry from the *Rocket* of 1830 to the 176-ton London and North Eastern Railway twenty-wheeled banking engine of the "Garratt" type, the largest in this country, with a boiler 7 ft. in diameter. The largest express engines of the four grouped railways are of the *King George V* class, Great Western Railway, weighing 135 tons 14 cwt. with tender; the *Princess Royal* class, London Midland and Scottish Railway, weighing 158 tons 12 cwt. with tender; the *Cock o' the North* class, London and North Eastern Railway, having a weight with tender of no less than 165 tons 11 cwt. and used for



GROWTH OF THE RAILWAYS. II

1. The "Flying Scotsman," famous L.N.E.R. locomotive. 2. G.W.R. engine, "King George V" on run between Bristol and London, 118 miles in two hours. 3. Road-rail freighter, in service on West Highland section of L.N.E.R. It can be used either on road or rail and is capable of 30 m.p.h. 4. Early British locomotive. 5. One of Robert Stephenson's earliest colliery locomotives. 6. S.R. electric train. 7. Locomotive of the old Great Northern Railway, built in 1870.

Photos: Central; Fox; G.W.R.; L.M.S.R.; L.N.E.R.

work on the difficult Edinburgh-Aberdeen main line (the *Lord President*, of this class, was in 1936 the most powerful express locomotive in Britain); and the *Lord Nelson* class, Southern Railway, which weigh 140 tons. The largest freight types are the 149-ton 2-6-0 0-6-2 "Garrett" engines of the L.M.S.R. and the L.N.E.R. "Mikado" type, weighing exactly 100 tons without tender. The use of the superheater, on engines built since 1910, has enabled the steam to be dried to a hot gas, greatly enhancing efficiency. There are about 21,000 locomotives on British railways.

Rolling Stock. The design of passenger coaches was slowly developed from adaptations of stage coaches for first-class passengers, and open and canopied vehicles for third- and second-class travellers. To give more accommodation and comfort the six-wheeled vehicle was first evolved; the first coaches with eight wheels, carried on two flexible bogies, were the Pullman buffet cars imported from the United States of America by the Midland Railway in 1874. The previous year had seen the inauguration of sleeping cars for first-class passengers between London and Scotland, third-class passengers were not generally carried by all trains until after the Midland Railway abolished second-class accommodation in 1875. Third-class dining cars were introduced in 1891, and two years later the first corridor train ran from King's Cross to Edinburgh. The first all-Pullman luxury train was the *Southern Belle* (now an electric train made up in five-car units, known as the *Brighton Belle*) which entered service in 1908. In the post-war period there has been a tendency toward coaches of the American type, in which open saloons replace the small compartments. Third-class sleepers have been in service between London and Scotland and London and Penzance. There are some 60,000 coaching vehicles in this country.

The standard British goods wagon holds 10 or 12 tons, compared with 50 tons and upwards in the United States. This is largely due to the shorter distances and different trading conditions in this country. British railways excel, however, in provision for exceptional traffic, from milk in glass-lined tanks to special wagons for motor bodies, bananas, cement and many other commodities. Concentrated loads up to 160 tons can be carried on special wagons having up to 50 wheels.

Efforts are now being made to increase the popularity of the economical 20-ton wagon for coal traffic. For working on fast trains, many wagons of the 650,000 owned by the British railways are fitted with the

continuous brake. Some 600 trains run nightly with express freight between the principal cities, the consignments being destined for next morning delivery. An advantage possessed by British railways lies in the fact that the services of goods collection and delivery are under railway control, enabling consignments to be carried at minimum cost and with the least possible delay.

Other Forms of Motive Power. While in other countries, notably the United States and Germany, diesel-electric railcars provide some of the fastest long-distance journeys—that of the *Flying Coloner* being booked at a speed of 82.3 m.p.h. over one stage—in Great Britain steam traction provides remarkable instances of heavy trains hauled at very high average speeds. The L.N.E.R. *Silver Jubilee* express, consisting of special stock hauled by a streamlined locomotive, travels to and from London and Newcastle in four hours, the 232 miles from King's Cross to Darlington being traversed at an average of 70 m.p.h. The Great Western train, the *Cheltenham Flyer*, usually hauled by a locomotive of the "Castle" class, runs from Swindon to Paddington at an average speed of 71.4 m.p.h. Diesel railcars are employed extensively for short and fast journeys on the Great Western Railway, and to some extent on the London and North Eastern Railway. They have also been introduced for branch line work on the Metropolitan (L.P.E.R.) Railway.

Electric traction was first inaugurated on Volk's Electric Railway at Brighton in August, 1883. Previously, in 1842, experiments with a battery-driven locomotive had been made on the Edinburgh and Glasgow Railway. The City and South London deep level tube railway adopted electric traction in 1890, and the Metropolitan and Metropolitan District Railways were converted in 1905-6. It was naturally employed in the confined tunnels of the London tubes from the commencement, but the advantages of electric operation for certain steam railways with dense traffic were early recognized, the principal benefit being that of more rapid acceleration. The Liverpool-Southport line of the Lancashire and Yorkshire Railway and the north Tyneside lines between Newcastle and Whitley Bay of the North Eastern Railway were electrified in 1904.

The greatest suburban electrified system in the world, comprising, in 1935, 447 route miles and 1157 miles of electrified track, is that of the Southern Railway. It was initiated by the former London, Brighton and South Coast Railway in 1909 with a 6600-volt alternating current system supplied from overhead conductors. In 1915 the London



RAILWAY ACTIVITIES

1. L.N.E.R. coaling plant at Hornsey. 2. Wide gauge milk tank on narrow gauge ada collecting station. 3. Loading chalk during the excavation of Southampton Graving l snow-plough. 5. Track laying machine. The crane swings sections of track from the rear to the permanent way as it advances. 6. Train entering the Channel train ferry. 7. Transporting bridge girders on special trucks.

Photos: Fox; Photopress; Topical

and South Western Railway opened its first electrified section—from Waterloo to East Putney and Wimbledon—on a system using a third rail as a conductor for direct current at 650 volts. This method was adopted for the Southern Railway, which in 1933 accomplished a main-line electrification from London to Brighton. Main lines to Portsmouth and Hastings are in process of conversion under a Government-assisted scheme of 1935. The London and North Eastern Railway is about to electrify the main line from Sheffield to Manchester through Woodhead Tunnel, where electric traction will assist ventilation problems. This will afford an opportunity for study of this method of propulsion on heavy freight as well as express passenger traffic over a steeply graded route. The system to be adopted is the British standard laid down by the Ministry of Transport, in 1927, of 1500 volts direct current supplied by overhead conductors. See **ELECTRIC RAILWAY**.

Safety on Railways. How well safety has been achieved on railways may be judged by a comparison of the road and rail accident records. The signalling is arranged on the "block system," the signals always preserving a space—the length of the block—between trains. In early years "policemen" (forerunners of the present signalmen) were employed to control train movements. The next development was the interlocking of points and signals, as devised by William Saxby, in order that conflicting train movements should be rendered impossible. Later, these became required by law, together with the use of the absolute block system on all passenger lines. The operation of signalling is greatly facilitated by the telegraph, which was first used by railways for communication.

To-day power is frequently used for point and signal operation, and over many miles of congested lines trains signal themselves, the track being divided into sections, and electric currents passed from one rail to the other through the wheels and axles of the train to effect the operation of the mechanism. All signalling is so devised that a breakdown causes a danger indication to be manifested. While semaphore signals are normally used, a horizontal indication denoting "danger" and a rise to an angle of 45° (or a similar fall) "proceed," day colour lights have been increasingly installed on main lines. This type of signal, which is now used at many street and road traffic intersections, is likely to replace the semaphore.

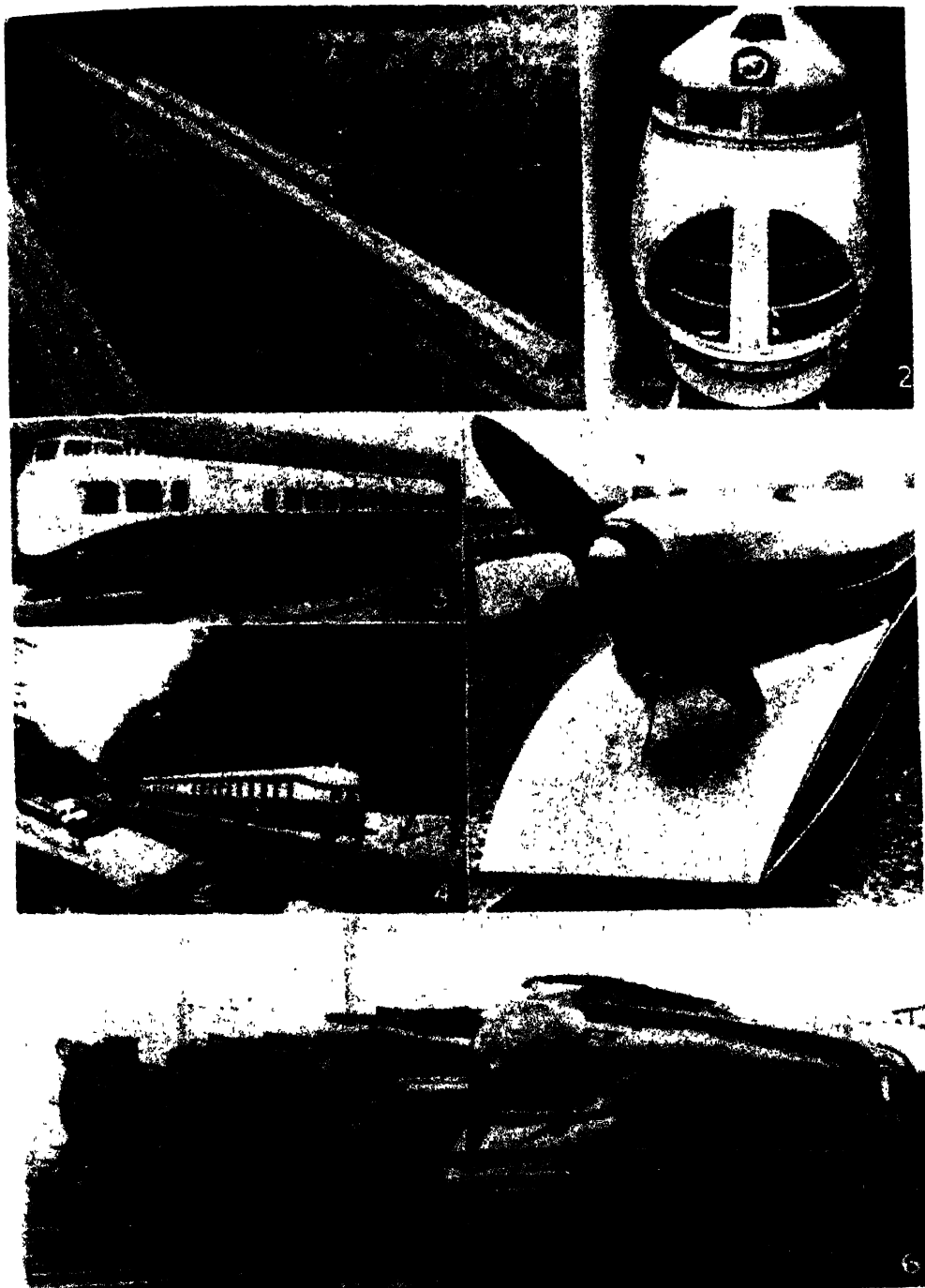
RAILWAYS, UNDERGROUND. See **UNDERGROUND RAILWAYS**.

RAIN. The result of condensation of the water vapour that is held in suspension in

the atmosphere. It is more liable to occur in a body of air with a high relative humidity than in one with a low relative humidity; that is to say, a body of air which is nearly saturated with water vapour is more likely to cause rainfall than one which contains only a small proportion of the water vapour that it is able to carry. The amount of water vapour that a body of air can hold depends on the temperature of the air, the capacity increasing with rise of temperature and decreasing with a fall of temperature. Thus any influence that causes temperature to fall provides the likelihood of rainfall, and the water vapour will condense as drops of rain when the temperature reaches the saturation-point for the amount of vapour held in suspension. Dust particles promote the formation of rain drops, since tiny particles of water collect around them on condensation, but dust is not essential to precipitation. Condensation generally begins in the formation of minute drops, which float in the air and cause mist or low cloud; further cooling causes their aggregation into raindrops.

The cooling of air sufficiently to cause rainfall is caused in various ways. A current of air of high relative humidity flows toward the land, its deviation being determined by difference in atmospheric pressure. High land across the direction of the air current causes it to rise; expansion occurs and causes lowering of temperature, and so rain results. Even in passing over low ground the air current may precipitate moisture, owing to friction with the land causing the air to rise, expand and cool. In other cases, cooling may result from warm air rising by decreased density, expanding and cooling, as in the so-called convectional rainfall of equatorial regions. The meeting of warm and cold air currents also may cause rain. This occurs in a thunderstorm.

The water vapour in the air is derived from the evaporation of moisture on the land, lakes, rivers and principally the sea. Winds coming from the sea generally have a high relative humidity; therefore slight cooling of them causes rainfall. Thus the rainy side of mountains is usually toward the sea, and the opposite side experiences drier winds, warmed by increased pressure in descending after crossing the range. Precipitation from air at a temperature below freezing-point falls in ice spicules which, collecting together in descent, form snowflakes. In very cold air, where the amount of water vapour is necessarily small, snow falls as fine ice dust, but if the fall passes into warmer air it reaches the earth as large melting flakes. The term "precipitation" includes the total amount of rainfall and snowfall in inches or



MODERN DEVELOPMENTS IN HIGH-SPEED AND LOCAL TRANSPORT

1. Stream-lined, Diesel-engined, Burlington Zephyr trains on long distance service in America. 2. Front view of an American stream-lined Diesel engine. 3. Pneumatic tyred rail-car on the L.M.S.R. It can travel at 75 m.p.h. 4. The "Flying Hamburger" does the 178 miles between Berlin and Hamburg in 2 hrs. 18 min. 5. Driven by an airscrew this special train attained a speed of 130 m.p.h. between Hamburg and Berlin. 6. Modern American locomotives. *Left:* Standard passenger engine. *Centre:* Two stream-lined electric engines. *Right:* Stream-lined steam locomotive.

Photos: Fax; Photopress; Topical

millimetres, one foot of snow being equal to 1 in. of rain.

The distribution of rainfall varies throughout the year in different parts of the world. The principal causes of variation are distance from the sea, the elevation of the land, and the nature of the surface. The greatest normal recorded rainfall is about 460 in. a year at Cherrapunji in Assam, and the lowest—except for desert regions such as in Sinai, parts of the Arabian Desert

owe their rain chiefly to strong winds from the sea—there monsoon rains being seasonal; and others that have practically no rain, owing to offshore winds or other local reasons.

In temperate regions, rain is associated with onshore winds and high ground. In warm temperate parts, chiefly winter rain occurs, with drought in summer in coastal regions, and slight rain in summer and less in winter in far interiors. Cool temperate regions tend to have rain all the year round, with a maximum in winter near the sea and a decreased amount with a summer maximum, far from the sea. Ocean currents have some influence on the distribution of rainfall. See also CLIMATE.

RAINBOW. A natural phenomenon observed in the part of the sky opposite the sun after rain, and caused by the reflection and refraction of the sun's rays as they fall on drops of rain. There are several colours in each bow; they are violet, indigo, blue, green, yellow, orange, and red, but they so overlap that the observer rarely distinguishes more than four or five. The space occupied by each colour depends upon the size of the raindrops and which the bow is formed.

We see the rainbow when the sun is at our back and rain is falling in front of us. As a ray from the sun passes into a drop of rain, the latter acts like a tiny prism; the ray is bent, or refracted, as it enters the drop, and is dispersed or separated into different colours. On striking the inner surface of the drop, it is reflected, or turned back, and on leaving the drop, is further refracted and dispersed. What we see

in the heavens is a natural spectrum, produced by successive drops.

A complete bow shows two bands of colours, the inner and brighter one being called the *primary* bow, and the outer and less distinct, the *secondary* bow. The primary bow has the red on the outside and the violet on the inside of the arch, while in the secondary bow, the colours are reversed. In the secondary bow there are two reflections within the drop. The higher the sun, the lower the bow, and if the sun is higher than forty degrees, no bow is visible. When the sun is near the horizon, an observer on a high mountain, or in a balloon, might see the whole circle of the rainbow. Rainbows are often observed in spray from a waterfall.

Occasionally, there is visible a rainbow



RAINBOW OVER NIAGARA FALLS
Photo: Cherry Kearton

and elsewhere, which normally have no rainfall—18 in. at Walvis Bay in South-west Africa. Lack of rainfall associated with high temperature causes hot deserts; considerable snowfall combined with low temperature causes the production of *névé* and ice sheets, which produce cold deserts.

In tropical regions, rainfall depends principally on latitude. The overhead sun causes ascending air currents charged with water vapour, from which rain is discharged on expansion and cooling. Thus the period of heavy rain coincides with the time of overhead sun. Equatorial regions are always wet, with two periods of maximum rainfall. Other tropical regions have two periods of rainfall separated by two dry periods, the lengths of each varying with the latitude. There are, however, tropical regions that

formed by the light of the moon. See **LIGHT; SPECTRUM.**

RAIN GAUGE, gayj. An instrument for collecting and measuring rain. A simple rain gauge resembles a cylindrical pill-box with a removable cover. Inside is a smaller tube which widens into a funnel at the top. As the area of the funnel is ten times that of the tube, one-tenth of an inch of water falling into the funnel fills the tube to a depth of 1 in. When the tube is full, the water overflows into a reservoir. With a rule divided into inches and tenths, instead of halves, quarters, and eighths, the water in the tube is measured. In case the fall of rain is so heavy that the water overflows, the water in the tube is poured out after measuring, and that in the reservoir is poured into the tube and measured. The sum of the two measurements is the amount of rainfall.

Rain gauges are placed on the ground, wherever practicable, in order to escape the effects of wind, which is known as the principal cause of deficient catch.

RAIN GOOSE. See **DIVER.**

RAISED BEACH. A raised beach is an ordinary but ancient sea beach which has been elevated above the present sea level. It is usually a rock platform, frequently covered with sand and gravel and often overgrown with vegetation. On the land side there may be found the ancient cliffs with their former sea caves

Such raised beaches are common round Scotland, forming terraces sometimes wide enough for towns to be built upon them, or occasionally, level tracts suitable for roads and railways. In some parts the beaches have been worn away by subsequent erosion



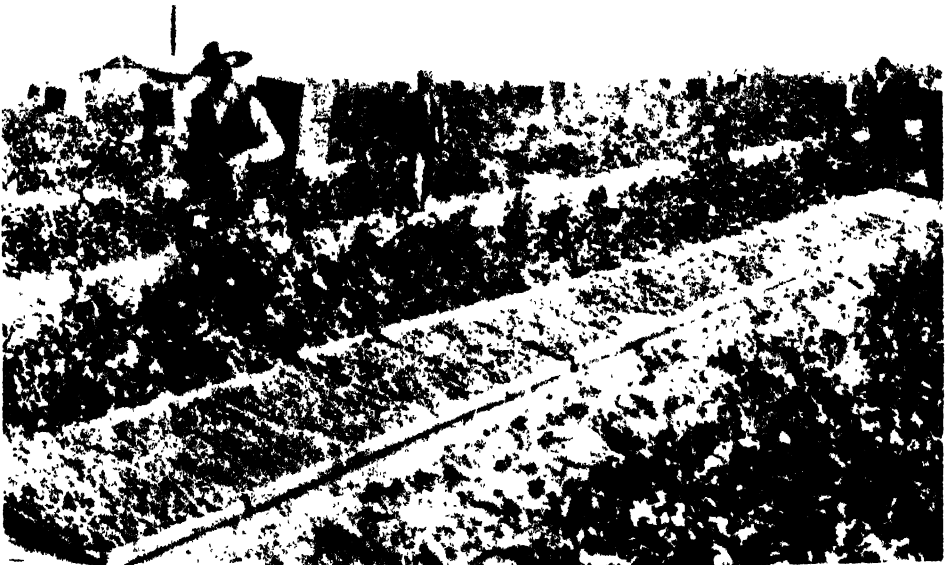
RAISED BEACH AT NEWQUAY
Photo H. E. Tavior

and only fragments remain adhering to the present cliffs.

Sometimes a succession of raised beaches or terraces may be seen which indicate pauses in the gradual upheaval of the land to its present height.

The famous raised beaches of Scandinavia are sometimes 600 ft. above sea level.

RAISINS. A species of dried grape, the culture of which is an important industry in the countries around the Mediterranean Sea



DRYING RAISIN GRAPES

Photo: Visual Education Service



RAJPUTANA

1. Lake and Palace at Udaipur. 2. The Dargah Street, Ajmer. 3. The marble Pavilion on the Anasagar Lake, Ajmer. 4. Lake Nakhl, with part of Mount Abu town. 5. Steps of the Dargah of Khwaja Sahib. 6. Rajput warrior. 7. Woman of Ajmer. 8. Stone images near Achalgarh on Mount Abu.

Photos. Indian Railways Bureau

and in Australia and California. The most famous variety is the Smyrna, a small seedless raisin.

The best raisins are made from grapes containing a large amount of sugar, and they are nearly always sun-dried. Occasionally, late-maturing varieties, which might be damaged by rain, are evaporated by artificial heat. Sometimes the bunches of grapes are simply cut partly through at the stem to stop the supply of sap, and then are left hanging on the vines to dry. Usually, however, they are picked and spread out in shallow trays in the hot sun. Raisins are wholesome and nutritious. See GRAPE.

RAJAH OR **RANA**. A Hindu title, meaning prince. A more exalted form of the title is Maharajah, great prince or king.

RAJPUTANA, *raj pu tah' na*. The name applied to a district in the north-west of the Deccan and in the Indus plains of India. The area is 131,175 sq. miles and the population is 11,512,914 of whom most are Hindu. Within the extent of Rajputana are twenty-one native states, including Jodhpur, Bikanir, Jaipur, and Udaipur. Most of the area is dry with a low rainfall. Millet is the chief crop, but wheat, barley, gram, and cotton are also grown. There are various native industries, including cotton and woollen goods. The western part is the sandy waste of the great Indian desert. No irrigation is possible. The chief rivers of Rajputana are the Chambal, Banas and Luni, and the only basin of any extent is the Sambhar salt lake.

RALEIGH, SIR WALTER (about 1552-1618). The Raleighs or Raleghs were an ancient family of Devon, a William de Raleigh had been Justiciar to Henry III. Walter was a younger son, and of his youth little is known. When he was about 16 he went up to Oriel College, Oxford, but left before receiving a degree, in order to join a band of gentlemen volunteers on their way to France to help the Huguenots (see HUGUENOTS). When he returned to England, he found his half-brother, Sir Humphrey Gilbert, about to embark on a voyage of discovery and privateering to America. He joined the party, which was forced to return without achieving success. Raleigh then became a captain in the army in Ireland. In 1581 the young man was sent to the English court with dispatches, and afterward he became a great favourite with Queen Elizabeth, who knighted him in 1584. He became wealthy through grants of lands and certain monopolies given him by the Queen, and was later made Warden of the Stannaries and Vice-Admiral of Devon. He caught the Queen's attention by his ready wit and gallant bearing rather than by his

achievements. The many-sided Elizabeth, delighted with one who was poet, scientist, courtier, man of affairs and man of action, made him Captain of the Guard and showered on him favours, personal and pecuniary. Yet she never entrusted him with high office.

Raleigh was intensely interested in discovery, and although the Queen would not permit him to leave England, he obtained



SIR WALTER RALEIGH
Photo: British Museum

privileges and sent several expeditions between 1584 and 1589, which were not immediately successful. The place where the adventurers attempted to settle—Virginia—was named in honour of the Virgin Queen. Potato and tobacco plants were taken to England from the new Virginia, so to Raleigh is given the credit for the introduction of tobacco into Europe, the potato having already become known to some extent in Spain. He cultivated both with success on the estates granted him in Ireland.

Raleigh had some part in the victory over the Spanish Armada in 1588. In 1592 he incurred the Queen's displeasure because of his intrigue with one of her maids of honour,

Elizabeth Throgmorton, and he was sent to the Tower. Here he married the devoted Bess, who was to prove a loyal helper in his later troubles. Elizabeth's anger, which is ungenerously ascribed to jealousy, seems to have been due to a real concern for her attendant's happiness. His imprisonment was short, but thereafter he was denied the



COAT OF ARMS OF SIR WALTER RALEIGH
These arms are set in the window of the room in which he was born, at Hayes Barton, Devonshire.
Photo: OROZ

privilege of appearing at the royal court. Raleigh was free to explore, and soon he sailed for America. It is said that, on the island of Trinidad, he found a lake of bubbling pitch, now world-famed as a source of asphalt. He explored the Orinoco River for more than 400 miles.

Raleigh was restored to favour in 1596 after the capture of Cadiz, for the success of which he had been responsible. The chief credit, however, went to the Earl of Essex, who had been his rival for the Queen's favour since 1587. They quarrelled fiercely in 1597, during an unsuccessful expedition to the Azores.

Raleigh was coldly received by James I. A hare-brained plot in favour of Arabella Stuart was discovered, of which the discontented Raleigh may have had some knowledge. He was condemned to death in a grotesquely unfair trial at Winchester, but was then sent to the Tower. His lands and monopolies were given to the new favourites, Lady Raleigh's passionate appeals being rebuffed by James. He lived in moderate comfort, his wife and children with him, and devoted himself to literature and chemistry. He embarked on a *History of the World*, he compounded a

cordial long held in favour; it is said that he studied how to make seawater drinkable and used the method on his last voyage.

In 1617 Raleigh asked to be allowed to undertake another treasure-hunting voyage, and promised to bring wealth to the impetuous James. He was set free and sailed under the impossible condition of doing no injury to the Spaniards, who had been warned of the expedition. He reached the Orinoco, where an advance party unsuccessfully attacked a Spanish settlement, Raleigh's son being killed. Raleigh returned empty-handed, to be beheaded on a fourteen-year-old sentence.

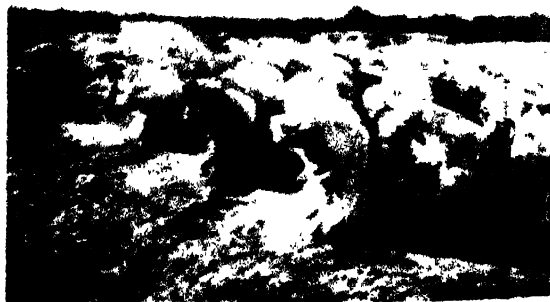
Of all the great Elizabethans, Raleigh was the most diversely gifted, yet his actual achievements were few. His *History*, written in stately and moving prose, is a magnificent fragment. He was the forerunner of Empire, but his own Virginian settlements failed. At the height of his powers he was never trusted with great affairs or with high command.

RAM. A weapon of two distinct types, the one an engine of siege warfare, the other the curving forward under water of the prow of a warship to form a weapon to hole and sink an enemy ship. Neither is in use to day.

The smaller siege weapons were worked by a number of men by hand to batter down doors or gates. The larger ones were slung between two towers on small wheels, the actual ram consisted of a huge beam, often capped at the striking end with a bronze ram's head, whence the name.

The weight and speed of modern warships rendered the ram unnecessary, although the tactics of endeavouring to ram an enemy ship were employed in attacks by destroyers and against submarines during the World War.

RAM, HYDRAULIC. See HYDRAULIC RAM.



MOHAMMEDANS AT PRAYER
Photo: I. Ali Shah

RAMADAN, ram' a dahn. Ninth month of the Moslem year; observed by fasting. See FASTS AND FASTING; MOHAMMEDANISM.

RAMAYANA, *rah ma' yah na*. An epic poem of India containing 24,000 verses, second in length to the *Mahabharata*. Unlike the longer poem, it was written almost entirely by one author, the poet Valmiki, who is thought to have lived about the beginning of the Christian Era. The poem tells in detail the history of Rama, son of Dasaratha, King of Oudh, and his successful conflict with Ravana, king of demons, who dwelt in Lanka. Lanka has been identified with Ceylon. See *MAHABHARATA*; *SANSKRIT*.

RAMESES II, *ram' e seez* (reigned 1301-1234 B.C.). The greatest of twelve Pharaohs

called Rameses. Formerly, he was supposed to be the Pharaoh who oppressed the Children of Israel, but this is now considered improbable. He ascended the throne of Egypt when a young man, and reigned sixty-seven years. During the earlier part of his reign, he completed the reconquest of Palestine and sought in vain to break the Hittite power in Syria. He later formed an offensive and defensive alliance with the Hittites, marrying the daughter of their king as an evidence of good faith. The latter part of his reign was peaceful. The mummy of the king was discovered in 1881



COLOSSI OF RAMESES II

Two of the four colossi which front the rock-hewn temple of Amon Ra at Abu Simbel on the Nile. This photograph was taken by moonlight, and the wavy lines at the feet of the Colossi were caused by the lamps of guides who passed during the exposure.

Photo: P. & A.

near Thebes, and later it was removed to the museum at Cairo.

RAMPION. There are only two species in this genus of the bell-flower family, the round-headed and the spiked rampion, neither of which is common. The flowers are usually of a shade of blue, and are in dense round heads. The stalk leaves on either plant are without stems and are lance-like in shape. The root of the spiked rampion is thick and edible.

Scientific Names. The round-headed rampion is *Phyteuma orbiculare*; the spiked is *P. spicatum*.



SIR WILLIAM RAMSAY
Photo: Photopress

RAMSAY, SIR WILLIAM (1852-1916). A prominent British scientist. He was a nephew of Sir Andrew Ramsay, the geologist. After studying in Glasgow, the city in which he was born, Ramsay spent several years abroad until 1872, when he received an appointment at Anderson's College,

Glasgow. Later he received high appointments at Bristol and London Universities. In 1894 he and Lord Rayleigh discovered the gas argon; later Ramsay obtained helium from the atmosphere and discovered neon, krypton and xenon. He was recognized as a leading authority on chemistry. His services to science were recognized in 1895, when he was awarded the Davy Medal of the Royal Society and the Nobel Prize for Chemistry in 1902.

RAMSAY, SIR WILLIAM MITCHELL (born 1851). An eminent archaeologist, son of Thomas Ramsay of Alloa, he was born in Glasgow and educated in Belfast, at the Alloa Academy, and at the Gymnasium, Old Aberdeen. The lessons of his wide travels found expression in his literary works. These include the *Historical Geography of Asia Minor*, *The Cities and Bishoprics of Phrygia*, *The Letters to the Seven Churches of Asia*, *An Ideal in European History* (1909), and *The Asiatic Element in Greek Civilization* (1927). He was knighted in 1906. He is one of the original members of the British Academy.

RAMSEY. See HUNTINGDONSHIRE.

RAMSGATE. A Municipal Borough and

holiday resort of East Kent, situated on the Isle of Thanet, with a population of 33,597 in 1931. Though the town is on the site of an ancient settlement, its history begins at a comparatively recent time. Building did not commence on a large scale until the middle of the eighteenth century, and it was not incorporated as a borough until 1884. There are, therefore, few ancient buildings in the town except the parish church of St. Lawrence, which was formerly the chapel of Minster. Ramsgate's history is linked up with the village of Ebbsfleet on Pegwell Bay, for it was here, according to tradition, that the Jutes Hengist and Horsa landed in the fifth century, and here, too, Saint Augustine landed in 597. Ramsgate has a good harbour and many attractions as a holiday resort.

RAND. See UNION OF SOUTH AFRICA.

RANGEFINDERS. Instruments for determining the range or distance to any remote object, generally used either for mapping unreachable points, or for military purposes. With the exception of the field-glass type, which when properly focused for the user reads off the distance on a scale on the adjusting mechanism, all depend upon a base of known length, a right angle, and an adjustable reflector.

One image is seen through telescope prisms in the fixed or right-angle end, and a second is secured by manipulating the adjustable reflector, by means of a thumb



RAMSGATE

Showing the bathing pool and Venetian lagoon.

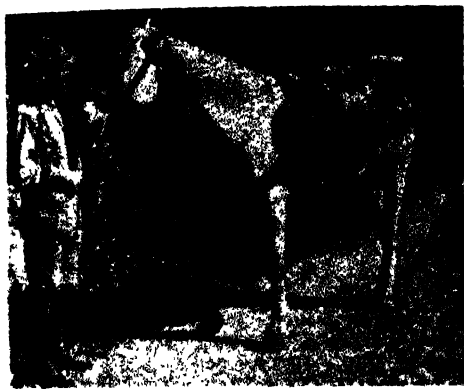
Photo: Ramsgate Corporation

screw, until the distant object is brought into the area of vision.

When these two images coincide, the instrument is set and the distance can be read off a scale.

The size of base varies from the 3 ft. of the Barr and Stroud Army rangefinder, through the 25 yds. of the obsolete Mekometer, to the base of 50 yds. in use in the largest battleships, in which the constantly changing factors of speed and course demand the greatest accuracy in the rangefinders.

RANGER. During the last four centuries the term Ranger has been in use in England, and is used at the present time. It was commonly applied to any who wandered or roamed about the country without set purpose, or to one who was in charge of pastur-



FOREST RANGER OF BRITISH COLUMBIA
The horse is packing fire-fighting apparatus.
Photo Topical

ing cattle over a stretch or "range" of country. In the sixteenth century the title was applied to forest officers and to game-keepers. It became also the official title of Keepers of the Royal Parks, and from the time of the Tudors these offices were held by prominent barons and Court favourites. To-day we still have Rangers of the Royal and many other parks. As territories developed abroad, especially in Australia, Canada and other British Colonies, the term Rangers was applied to bodies of mounted troops or police or other armed men charged with keeping order over large areas.

RANGOON, rang goon'. The capital of Burma (which see).

RANJIT SINGH, run jeel' sing (1780-1839). A native ruler of the Punjab; the son of a Sikh chieftain. His father died in 1786. In 1797 he gained control of the government, and directed all his energies to founding a kingdom which should unite all the Sikh provinces. He was granted Lahore by the Emir of Afghanistan, and within a few years subdued all the northern provinces. The chiefs of the provinces to the south asked for British protection, and in 1809 an agreement was reached whereby

the River Sutlej became the southern boundary of Ranjit's dominions. Ranjit then made a complete conquest of the Punjab. In 1836 he suffered a severe defeat by the Afghans. He remained always loyal to the British in India.

RANK. A grade in the army, navy, or air-force. A non-commissioned officer can be reduced in rank for misconduct, but a commissioned officer can lose only seniority unless cashiered. Acting officers hold not rank, but appointments and these can be revoked. For details of ranks in the Services see Guide Volume.

RANKE, rahng' kē, LEOPOLD VON (1795-1886). A German historian, born at Wiehe, in Thuringia. In 1818 he became a teacher of history at Frankfort-on-the-Oder. His first book was a history of the Romance and Teutonic nations; it won for him, in 1825, a position in the University of Berlin, and two years later, he was sent at Government expense to Italy, to study sources. In 1837 Ranke was made full professor at Berlin.

Many of his works have been translated into English. Among these are *Civil Wars and Monarchy in France*, *History of England, principally in the Seventeenth Century*; *History of the Latin and Teutonic Nations (1494-1514)*, *History of the Reformation in Germany*, and *History of the Popes during the Sixteenth and Seventeenth Centuries*—his best-known work.

RANUNCULUS, ra nung' kû lus. A group of annual or perennial herbs belonging to the buttercup, or crowfoot, family. These plants form the representative genus of the family. Of the numerous species, the best-known are the crowfoot, buttercup and spearwort groups. The plants bear white or yellow flowers, and grow commonly in pastures and gardens or in moist places. Many of them contain bitter juices.

RAPALLO, rā pal' lo, TREATIES OF. A treaty signed by Italy and Yugoslavia in 1920, making provisional settlement of a long dispute over the possession of territories just east of the Adriatic, inhabited by Slavs and Italians. Fiume was created an independent state, Italy annexed part of Carniola and all Istria, pushed its frontier east to Fiume, and relinquished claims to Dalmatia.

In 1924 Fiume was given to Italy, Yugoslavia leasing a port in Fiume harbour, and Italy's sovereignty over Port Baros and Dalmatia was recognized.

An economic agreement between Germany and the Union of Soviet Socialist Republics signed in 1922 is also known as a Treaty of Rapallo.

RAPE (Latin, *rapio*, I seize). A term which may be applied to any forcible taking

or robbery (as in the title of Pope's poem, *The Rape of the Lock*), but most commonly used in its legal sense to denote the felony of having carnal knowledge of a woman without her consent. Consent must be genuine and free. The maximum punishment for rape is penal servitude for life.

RAPE. An annual plant also known as *coleseed*, cultivated for its herbage, and especially for its oil-producing seeds. It has a slender, carrot-like root, is sown in drills when the seed is to be harvested, and otherwise is sown broadcast. It is cut with a sickle, and when dried, the seed is thrashed out. A cake, for cattle food, is made of the seeds, after the oil is extracted.

RAPHAEL SANTI (1483-1520). One of the greatest of Italian painters, called the "Divine Raphael" and the "Prince of Italian Painting."

Raphael was born at Urbino, Marche. From his father, a painter of some reputation,

he received his first art instruction. When about 17 years of age, he was apprenticed to Perugino. Among the best works of this, the Umbrian period, are "Marriage of the Virgin," (Milan) and several Madonnas.

In 1504 Raphael went to Florence, where he rapidly gained a wider knowledge of his art, assimilating many of the qualities of



RAPHAEL
Photo: Brown Bros.

the famous group of artists of that city, among whom were Masaccio, Fra Bartolommeo, Leonardo da Vinci and Michelangelo. Here he developed his Florentine style, and among his paintings during this period are the "Entombment," "La Belle Jardinière" (Louvre), and the "Madonna with the Goldfinch" (Uffizi, at Florence).

In 1508 he was invited to Rome by Bramante, and Pope Julius II becoming his friend and patron, commissioned him to re-decorate the Borgia Apartments at the Vatican; his magnificent series of frescoes were now executed there.

In addition to his public works, private commissions for paintings came so fast that he was obliged to leave the execution of some of the frescoes to his pupils, he himself preparing the cartoons from which the designs were traced.

Under the patronage of the succeeding Pope, Leo X, Raphael was appointed chief

architect of St. Peter's, and some of his best known Madonnas belong to this later Roman period, as for example, the "Madonna of the Chair" (Pitti Palace, Florence) and the unique "Sistine Madonna" (Dresden). Two other masterpieces, "Christ bearing the Cross" (Madrid) and the "Transfiguration" (Vatican) were painted shortly before his death in 1520 at the early age of 37.

RAPIER. See **SWORD**.

RASMUSSEN, KNUD JOHAN VICTOR (1879-1933). A Danish Arctic explorer and authority on Eskimo peoples. He was born at Jakobshavn, Greenland, where his father was a missionary, and educated at the University of Copenhagen.

Rasmussen's expeditions to Greenland, and Arctic Canada during the period from 1902 onwards enabled him to cover all Eskimo territory, and to make important ethnological studies of the Eskimo tribes. His conclusion was that they were descended from inland tribes who had migrated to the coast. Rasmussen founded the trading station of Thule in Northern Greenland.

His books include *Greenland by the Polar Sea*, *Eskimo Folk Tales*, and *The People of the Polar North*.

RASPBERRY. A bush fruit whose thorny "canes" bear delicately flavoured berries. It is a native of the northern hemisphere, and belongs to the rose family, *Rosaceae*. The fruit is a little cap, a collection of drupelets, each with a small seed at the centre. When ripe, the cap separates from the standard about which it grows, and it is this peculiarity that distinguishes the raspberry from the blackberry (which see).

Numerous varieties have been developed by fruit-growers. Most are derived from the European red raspberry (*Rubus idaeus*), while other kinds derived from the American red raspberry (*R. strigosus*) and the American black raspberry (*R. occidentalis*) are grown on that Continent.

The propagation is mainly by transplanting suckers that rise from the roots; but in some varieties layering is the most satisfactory method, i.e. the tips of the stalks, when bent over and covered with soil, send out roots, and the rooted tips are transplanted the following season. Raspberries make their best growth in fine, deep, sandy loam, and in regions of cool summers. They are hardy in Britain, and are best trained on wires or trellis, the preceding year's canes being cut away in spring. The fibrous roots grow near to the surface.

RASPUTIN, GREGORY (1871-1916). A Russian monk of peasant birth, uncouth and unlettered, who exercised a baleful influence upon the royal family during the last years of the Czarist regime. He gained such power

at Court that his murder was planned and carried out by a group of nobles.

RASTADT, *rah' shiaht*, TREATY OF. 'See SUCCESSION WARS.

RAT. One of the larger rodents (gnawing animals). The two most common species, the *black* and the *brown* rats, are found in nearly



GIANT RAT

This native of central Africa is a foot and a half in length.

Photo: Cherry Kearton

all parts of the world. The black rat is between 7 and 8 in. in length, exclusive of the tail, while the brown grows to be 10 or 11 in. long. These animals infest ships, wharves, dark and neglected buildings, barns, sewers, and dwelling-houses.

Rats are destructive to stored grain, young poultry, fruits, vegetables, eggs, etc. Their



RAILWAY RAT-CATCHER

Putting a ferret down a hole in a railway embankment, which, if undisturbed, the rats would undermine.

Photo: Fox

sharp teeth can gnaw through wood or plaster. They have a keen sense of smell.

Rats breed several times a year, producing from six to fifteen young in a litter. This tendency to rapid multiplication, combined

with the fact that rats are carriers of disease (see **PLAGUE**), makes necessary a ruthless war against them.

It is far more important to keep rats from breeding than it is to destroy them after they have become numerous. The former result can usually be accomplished by keeping all refuse in closed metal containers and by making buildings rat-proof with wire netting and concrete, thus limiting their food supply and hiding-places.

The most effective means of destroying rats is by the use of traps and poisons. Arsenic, barium chloride, and strychnine are good poisons.

Scientific Names. Rats belong to the family *Muridae*. The black rat is *Rattus rattus*; the brown, *R. norvegicus*.

RATCHET, *rach' et*. Device for preventing backward motion in a toothed wheel. It consists of a piece of metal hung on a pivot at one end, and having the other end so shaped that it will fit the space between the teeth of the wheel and act as a brace. A *ratchet wheel* is a toothed wheel rotated by a ratchet that is attached to a lever having a forward-and-backward or an up-and-down motion. The wheel that moves the carriage of a typewriter forward is a good example.

RATE. A charge levied for local purposes, based upon an assessment of the annual value of property, its effect being to spread the cost of services established in the locality for the public benefit over all persons liable to contribute.

The British system of meeting the expenditure of local authorities, while serving as a model for the Dominions, differs widely from Continental systems. In Britain the local authority is left to collect sufficient revenue for its expenditure by means of a rate levied on the property, which has been valued by local assessment, but abroad local revenues are often collected centrally at the same time and on the same basis as national taxation, and then passed on to the local authority.

The principle of rating adopted by Britain can be traced back to 1601, when the first Poor Rate was authorized to be levied on *occupiers* of property in order to maintain the poor of the parish (see **POOR LAWS**). To the poor rate were added other rates as the scope of local government widened, but it was not until the Rating and Valuation Act, 1925, that provision was made for these numerous rates to be consolidated and collected as one "General Rate." On the back of every rate demand, however, is shown how the proceeds of the rate will be allocated.

Rating Authorities. Before 1st April, 1927, when the Rating and Valuation Act,

1925, came into force, the authority for fixing and collecting the poor rate was the Overseer, whose office had survived from Elizabethan days. Other authorities who derived revenues from local rates made precepts on the Overseer. Now the office of Overseer has been abolished, and the rating authorities are the councils of the county boroughs, boroughs, urban districts, and rural districts. In Scotland the Rating (Scotland) Act, 1926, provided for only two authorities—the town council of a burgh and the County council of a county. In Northern Ireland the rating authorities are the councils of the counties, county boroughs, boroughs, and urban districts. The areas of the rating authorities are "rating areas" and it is the duty of each authority to make the valuation of property, fix the rate in the £ to be paid on this valuation, collect the rates, and hand over any sums demanded by the precepting authorities, e.g. English county councils who claim for the cost of main roads, poor relief, education, police, etc. (see LOCAL GOVERNMENT). Certain property is exempt from local rating, e.g. property occupied for Crown purposes, by scientific societies, and by ambassadors; places of worship and Sunday schools; light-houses; and agricultural land (a recent exemption to assist a depressed industry). Voluntary hospitals are assessed at a nominal figure. Rates are levied on occupiers, and unoccupied premises are not rateable.

Principles of Rating. Theoretically, rate-payers contribute to the cost of local services in proportion to the benefit they derive therefrom, and the standard adopted to ascertain the amount of benefit is the rateable value (see below) of the property occupied. In practice there are many anomalies. For example, a family man who does not take advantage of "free" education for his children still pays his quota of the cost of the national system of education.

Assessment of Property. There is now a quinquennial valuation of property for rating purposes, the occupier being called upon to supply details to enable the rating authority, through its rating committee, to compile the VALUATION LIST. Both the gross and net annual values must be declared, the gross value being the rent at which the property might reasonably be expected to let if the tenant undertook to pay the rates and the tithe rentcharge, if any. The net annual value is the gross value, less an allowance for repairs and insurance. It is the *net annual value* which is the rateable value. In the case of factories, mills, etc., the machinery installed is also taken into account in the assessment.

The country is divided into Assessment

Areas which, in England and Wales, are county boroughs and, outside the county boroughs, divisions of the county. Each assessment area has its Assessment Committee appointed by the councils concerned. There is also a County Valuation Committee to promote uniformity of assessment within the county by making suggestions to the assessment committees and by protesting, where necessary, against certain valuations in the lists. A Central Valuation Committee has been set up to promote uniformity throughout the whole country.

Objections to the proposed valuation list, by individuals, local authorities, and the county valuation committee, are heard by the assessment committee, with the right of appeal to the Court of Quarter Sessions, with further appeal, on a point of law, to the High Court, Court of Appeal, and finally the House of Lords.

When the draft list has been approved by the assessment committee, the rating authority is able to use it for imposing the general rate. Estimates are made of the likely expenditure of the authority, precepts are made on the authority by bodies who turn to it for finance; and the total sum required, related to the total of the valuation list, exhibits a proportion of so much in the £. It is this proportion of his rateable value that the occupier of property is called upon to subscribe.

RATEL, *ray' tel*. A small animal of India and Africa, belonging to the bear group.



RATEL

Photo. E. J. Hoshing

It is dark grey on the upper part and black below. The African ratel has a distinct white line around the body between the black and grey fur. Its teeth are smaller and weaker than those of the Indian animal. The ratel eats insects, frogs, birds, and rats. It likes honey, and is sometimes called *honey badger*.

Scientific Names. Ratels belong to the family *Mustelidae*. The African species is *Mellivora capensis* the Indian, *M. indica*.

RATHBONE, ELEANOR. Distinguished in many spheres of public life, Miss Eleanor



ELEANOR RATHBONE
Photo: Topical

Rathbone was in 1909 the first woman to be elected to the Liverpool City Council. She showed her talent for organization during the World War, when associated with the Soldiers' and Sailors' Families Association. Since 1929 she has represented the Combined English Universities in Parliament, standing as an Independent.

RATIFICATION.

The adoption by a principal of some

act done by an agent on his behalf. In law, where an agent is acting within the scope of his authority, a contract made by him is binding on his principal, without any need for ratification; but where the agent exceeds his authority, the principal is not bound unless he chooses to ratify the contract. See AGENT.

RATING. See RATE.

RATIO, *ray'shio*. The relation which one quantity has to another quantity of the same kind. The only way in which the relative size of two quantities can be compared is by division. Now a fraction is always an expression of division. Ratio is therefore expressed by a common fraction, as $\frac{2}{3}$ and $\frac{11}{8}$. The fraction $\frac{2}{3}$ expresses the ratio of 2 to 3. The fraction $\frac{11}{8}$ expresses the ratio of 11 to 8. These ratios, instead of being written as fractions, are also expressed as 2 : 3 and 11 : 8. See PROPORTION.

RATIONALISM, *rash' un al iz'm*. A term which in the broadest sense means *reasoning* as opposed to *faith*. As secular learning increased, men revolted more and more against any authority in matters of belief. They questioned not only the authority of the Church, but also that of the Bible, and certain scholars claimed that one could believe nothing unless it could be proved. Many philosophers taught that such instinctive feelings as love, trust, confidence, courage, and fear should have no influence on belief; that only the reasoning mind could say what was to be believed. Voltaire, Francis Bacon, Descartes, and Kant are a few of the men who taught rationalism in various forms. See SUPERNATURALISM.

RATIONALIZATION. In industry and commerce, the use of a technique and organization designed to secure the minimum

waste of either effort or materials. It includes the scientific organization of labour, standardization of both material and of products, simplification of processes, and improvements in the system of transport and marketing. This definition gives no indication that there is anything new in rationalization, and could apply equally well to such terms as "industrial efficiency," "scientific management," etc. The word came into use in industry after the World War, when the difficulties of trade were greatly increased by the burden of taxation, the adjustment of industry to the great changes in the world economic position, and to other consequences of the upheaval. In previous years industry had automatically adjusted itself to economic conditions, but the task after the War proved too heavy for ordinary methods, and there was a cry for "rationalization"—conscious control and readjustment.

Rationalization may be divided into two classes: external and internal. The former is concerned with the grouping and moulding together of previously independent and competing enterprises, while internal rationalization is the efficient organization of a firm's production, finance, personnel and distribution. The elimination of uneconomic competition is the immediate demand of external rationalization, and this has been attempted by the inauguration of some kind of cartel to fix prices and regulate output, and by the formation of combines.

RATIONING. The distribution of commodities, usually foodstuffs, according to a definite plan and method. Thus, soldiers and sailors are entitled to their daily rations of bread, meat, etc. Owing to the shortage of foods during the World War, the system of rationing was applied to the civil populations of the European belligerent countries, as well as to neutrals. Germany, cut off from supplies immediately on the outbreak of hostilities, felt the shortage early, and before the end of 1914 had instituted a system of bread cards which entitled the holders to be given quantities of bread. Great Britain, however, was not seriously disturbed by the food problem until 1917, though some inconvenience was caused in 1916 by the scarcity of sugar. The Ministry of Food, set up in June, 1917, was faced with ever dwindling supplies, owing to the German submarine campaign, and in the latter days of the war, the civil community had to be severely rationed. The Ministry concentrated on controlling supplies, regulating prices, and the registration of customers for meat, bacon, lard, butter, margarine, sugar, tea, and jam. Every household was registered and supplies were

distributed in definite quantities at the rate of so much per head. The housewife had to make her purchases from the retailer with whom she was registered, who had to register with a wholesaler, who in his turn had to deal with a registered manufacturer, importer or agent. Extensive local machinery in the way of food committees, Food Commissioners, etc., as well as elaborate central organization, was created.

RATTAN, *rat tan'*. Tough, fibrous material from the reedy stems of various species of



RATTAN PLANT

The bark must be removed to reveal the true cane.

palms found in East India and Africa. The rattan palms belong to the genus *Calamus*. Their stems, which are sometimes hundreds of feet long, have the peculiar habit of climbing over other trees by means of little hooks on the leaves. In the tropical coun-



WASHING RATTAN WITH SAND BEFORE SHIPMENT

tries where the rattan palms grow, the natives use the stems to make ropes and mats, and they are extensively imported by European and American countries for use in the manufacture of umbrella handles, walking-sticks, furniture, baskets, and chair bottoms.

The natives cut the stems into lengths of 5 to 20 ft. and then free them from the leaves and outer covering by pulling them through a notch in a tree or board. The finest quality rattan comes from the island of Borneo, and other valuable rattans are produced in Burma, Ceylon, Malaya, and Sumatra. Some rattan palms yield an edible fruit, and the young shoots are eaten like vegetables.

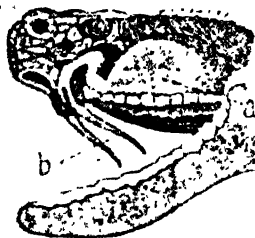
RATTLESNAKE. An American snake which gives full warning to an approaching



RATTLESNAKE COILED TO STRIKE

Photo: Visual Education Service

enemy by vibrating the end of its tail. This movement causes a set of hard rings to rattle. The rattlesnake injects poison through its fangs, and if the venom is not removed from the wound quickly it will cause death. These snakes live on rodents. They are common in North America and there are two species in South America; they do not exceed 5 ft. in length. The system of rattles is a series of hollow rings of horny material, loosely fitted together. Each ring fits over a part of the preceding one. Each time the skin is shed, which is two or three times a year, a new ring is formed.



HEAD OF RATTLESNAKE

(a) Poison sac, (b) Esophageal gland

The poison is contained in a pair of glands, one beside each upper jaw. Rattlesnakes bring forth their young alive and spend the winter in a torpid condition.

Species and Classification. Rattlesnakes belong to the sub-family *Crotalinae*, or pit vipers, of the family *Viperidae*. The most common species, *Crotalus horridus*, varies in colour from tawny to dark brown, and has numerous crossbars of irregular brown spots. There is a larger species, the diamond back rattlesnake, *C. adamanteus*.

RAUCH, rowK, CHRISTIAN DANIEL (1777-1857). A German sculptor. In his boyhood, Rauch served as a sculptor's apprentice. In 1797 he became valet to Frederick William III of Prussia. Later he studied at Rome. In 1819 he founded in Berlin a royal atelier of sculpture. His bronze statue of Field-Marshal Blücher and his busts of Goethe and Thorwaldsen are fine examples of his genius, but his masterpiece is the bronze statue of Frederick the Great in Berlin.

RAVEL, MAURICE (born 1875). A French composer, and a pupil of Faure. His music is in the romantic tradition of Chopin and Liszt, and he is best known for his piano and other chamber music. He has also written an opera,

Ravens are widely distributed in the northern hemisphere. Large specimens measure 26 in. in length and have a wing breadth



ATTLESLAKE AND
HAPARRAL BIRD
Photo U & U.



L'Heure Espagnole, a ballet, *Daphnis and Chloe*, an oratorio, *St. François d'Assisi*, and some tone poems for orchestra.



RAVEN
Photo: Dond

RAVEN. The largest of the crow family, a bird of much intelligence, known from the earliest times and connected with the history and mythology of many nations. It is the first bird named in the Bible (Genesis viii. 7). The Scandinavian peoples held the raven in veneration,

and when the Danes invaded England in the ninth century, their flag bore a black raven on a red field.

of 3 ft. They live as long as a man, and are said to mate for life. Their nests are built in the late winter, on crags or in ancient dwellings. The eggs are from three to eight in number and are of a light-greenish colour, blotched with brownish spots.

Scientific Name. Ravens belong to the family *Corvidae*. The British species is *Corvus corax*.

RAWLINSON, SIR HENRY CRESWICKE (1810-1895) Famous English Orientalist, diplomat and soldier. He saw much service in Persia and at Behistun, studied the famous cuneiform inscription which he transcribed and deciphered. He amassed a large collection of early antiquities from Persia and the surrounding districts. It is now in the British Museum.



SIR HENRY CRESWICKE
RAWLINSON
(National Portrait Gallery)

RAWLINSON, SIR HENRY SEYMOUR (1864-1925). A Commander-in-Chief of the British Army, he was educated at Eton and Sandhurst, and at the age of 21 accompanied Lord Roberts to India as his aide-de-camp. He served during the Burmese War (1886-7), was with Kitchener at Khartoum in 1898, and fought through the Boer War (1899-1902). Returning to England, Rawlinson became Commandant

of the Staff College. He rendered important service on the outbreak of the World War as chief officer of recruiting. Later he commanded the Seventh Division in Flanders and the new Fourth Army.

RAY. The common name for a group of fish including six different families. The



RAY FISH
Photo: Weller

general characteristic of the group is their possession of expanded and fleshy pectoral fins, which are seemingly continuations of the body. In some cases, these form, with the body, a flat disc. The six families are represented by the sawfish, the shark rays, the electric rays, the skates, the sting rays, and the eagle rays, or devil fish.

RAYNAUD'S, ray' nōz, DISEASE. A disease of the nervous centres which was first described by the French physician Raynaud in 1862. It most commonly affects the fingers and hands, but sometimes the toes, ears, or nose. It is far commoner in women than in men, and usually appears between the ages of 15 and 30. It consists in a constriction, of nervous origin, of the arterioles through which blood is supplied to the parts. The cause is unknown, but an attack in one who is subject to it is usually brought on by emotional upset or by cold.

The symptoms occur in three degrees of severity, as described by Raynaud. The least severe is *local syncope*, in which one or more of the fingers become cold and "dead" and white, and lose their feeling. This may last only a few minutes, or may persist for several hours; as the condition passes off, there is felt tingling and a certain degree of pain. The second degree is called *local asphyxia*. Here the parts affected are often more extensive; for example, the fingers and hand, on one or both sides, become blue or almost black, and there is some swelling in the limb immediately above. As before, recovery occurs and is accompanied by more severe pain as sensation is restored. The third degree, *local gangrene*, is similar, but now there is complete death of small portions of the tissues involved; these are shed, and scars are left, most commonly at the tips of the fingers or toes.

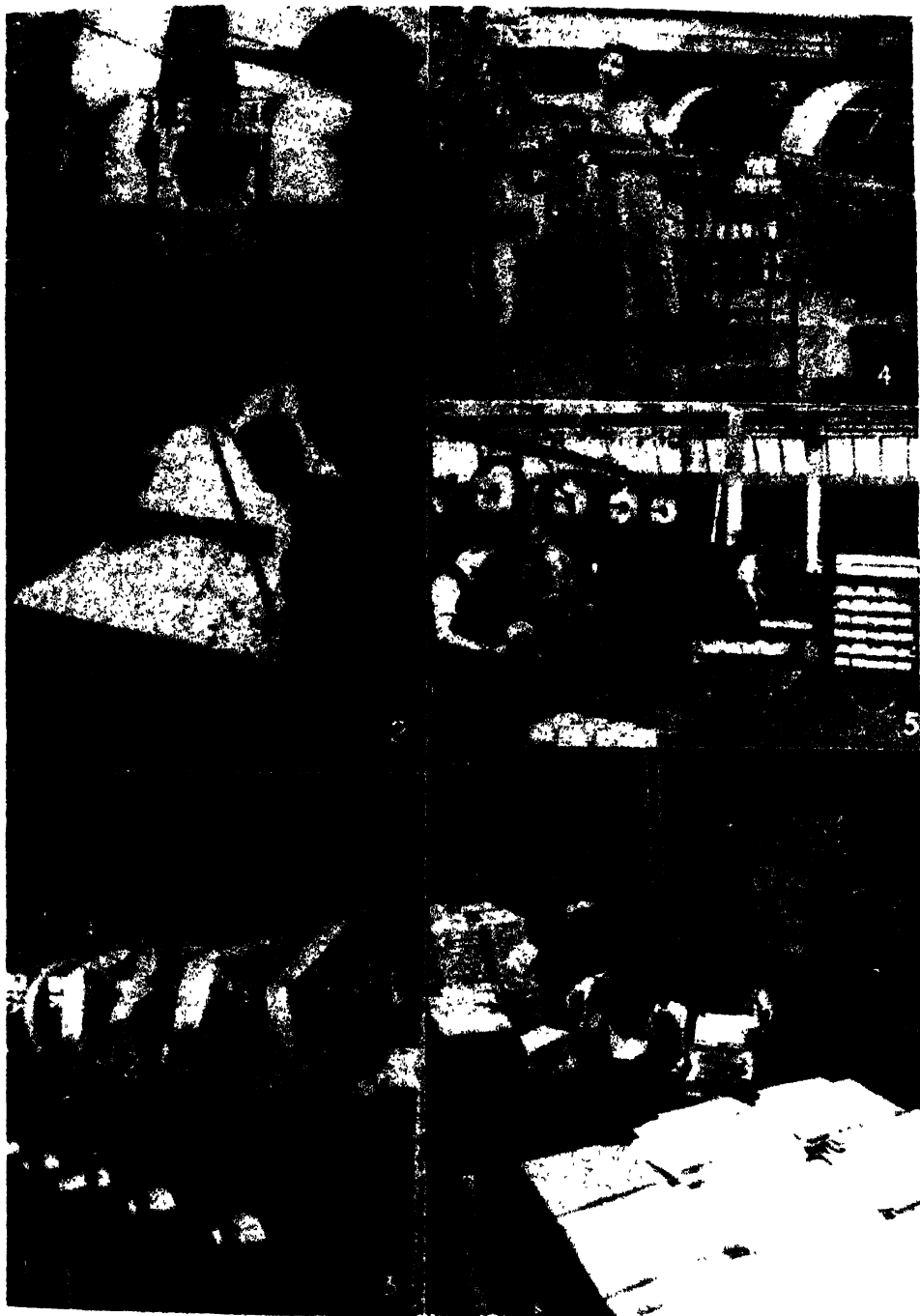
This complaint is treated by the continuous current of a galvanic battery, by the application of a tourniquet to the limb well above the seat of trouble for a few minutes daily, by warmth, and tonic medicines. Recovery usually occurs in the course of time.

RAYON. Another name for artificial silk, the word was coined in America and is being gradually adopted in England. Rayon is a textile with distinctive properties, and the term "artificial silk" is inaccurate. Rayon is manufactured from certain kinds of wood, cotton linters, esparto grass, waste flax, or from some other form of cellulose. Between silk and rayon there are certain superficial resemblances, but rayon does not possess the pleasant feel or the durability of pure silk. During the past few years, however, manufacturing processes have been so improved that very satisfactory rayon goods of every description are now being produced.

Rayon is widely used for ladies' hosiery and underwear of every description, for linings, jumpers, dress fabrics, for soft furnishings, for haberdashery goods and all manner of novelties, in the male wardrobe may be found ties, underwear, half hose, dressing gowns, etc., of rayon. It is also employed for insulating the wires of electrical apparatus. Rayon combines well with wool, cotton, and silk, and the various textile industries have been stimulated by the introduction of this new textile.

The world's production of rayon yarn in 1935 was 1,000,000,000 lb. With the exception of the early war years, world rayon yarn production has increased uninterruptedly from 1915 to 1935. The U.S.A. is the leading country in the manufacture and consumption of rayon yarn and rayon goods. In 1935 the United States produced 256,000,000 lb. of rayon yarn, which is 25 per cent of the world's total production. Japan and Italy came second and third respectively, Japan producing 215,000,000 lb. and Italy about 120,000,000 lb. of rayon yarn in 1935. Great Britain was fourth with 112,000,000 lb. Germany, France, the Netherlands, Belgium, and Switzerland are also rayon-producing countries.

There are four different processes employed by the various manufacturers, but all are based on the principle of forcing a cellulose solution through a system of minute orifices and hardening the emerging jets into solid filaments. The four types of rayon are known as (1) Chardonnet; (2) Viscose; (3) Cuprammonium; and (4) Cellulose acetate. Of the total production of rayon during 1935, viscose accounted for about 86 per cent, cellulose acetate 4 per cent, cuprammonium 9 per cent, and chardonnet less than 1 per cent. In producing chardonnet, the raw material is treated with



RAYON

1. Viscose solution is precipitated as thread when poured into acid. 2. Alkali cellulose crumbs being emptied from shredder. 3. Winding rayon from hand to bottle bobbin for hosiery manufacture. 4. Bobbins each on a separate spindle, making a warp. The threads are drawn from the bobbins through a fine comb to a revolving frame. 5. Viscose spinning machine, showing the doffing of rayon cakes. Viscose is pumped through platinum jets and coagulated by an acid bath. The viscose from each jet forms a fine fibre which is carried over a glass wheel into a rapidly revolving pot and there spun into a cake. 6. Stacking sheets of pulp in readiness for caustic steeping.

Photos - Courtaulds

sulphuric and nitric acids, and after further treatment, forms nitrocellulose or collodion. In the *cuprammonium* process, the



RAZOR-BILLS

Photographed on Lundy Island

Photo: John Kearton

cellulose is treated with copper oxide and churned up with ammonia. In the *acetate* process, the cellulose is treated with glacial acetic acid. In the production of *viscose*, the raw material is wood pulp from the spruce tree. The wood is freed from impurities such as resins, gums, etc., washed, bleached, and pressed into sheets. The sheets are saturated with caustic soda solution, and then churned up into "flocks." Further treatment with carbon disulphide reduces it to a syrupy fluid called "viscose." After ripening, the viscose is filtered and forced through the spinneret apparatus, the jets are coagulated in a chemical bath, thus becoming solid filaments of great length, and are then prepared for weaving. See also CELLULOSE.

RAZOR. A sharp cutting instrument used to remove hair from the skin. The standard type of modern razor has a blade from 3 to 4 in. in length, made of specially tempered steel, with a rounded back, sloping to a very fine edge. The blade is generally bound by a rivet to two pieces of metal, ivory or bone, between which the blade rests when not in use, closing like a springless knife. Manufacturers of Sheffield have for long had the reputation of making the best blades.

It is customary to smooth the cutting edge with a leather strop before the razor is used. The blade needs to be honed or sharpened occasionally.

There is an increasing demand for what are known as "safety razors." These have short, rectangular blades mounted at such an angle in holders that it is almost impossible to cut one's face during the operation of shaving. The disadvantage of this type is a tendency to quick wear of the blades.

RAZOR-BILL OR MURRE. A sea-bird inhabiting the rocky coastal regions of the north Atlantic. It is related to the Guillemot and Puffin (which see), and can be distinguished by the characteristic thin white line on the side of the head in the adult in breeding plumage. Only a single egg is laid in a rough nest on some rocky ledge.

Scientific Name. The razor-bill belongs to the family *Alcidae*. It is *Alca torda*.

RE, ray, or RA. The god of the sun in Egyptian mythology. After Re had brought the world into existence out of the original chaos, he reigned in peace until, in his old age, the gods became unruly and raised a rebellion against him. Because of this rebellion, all must have perished, had not Re himself called back the goddess Hathor, whom he had sent to destroy them. But the weight of his years told on his spirit, and finally he willingly resigned his rule and retired to the heavens, where he rests on the back of the celestial cow. In Egyptian art Re is a hawk-headed man, holding the scepter of divinity in one hand and the symbol of life in the other. His head is crowned with a disc and serpent.

REACTIONS, CHEMICAL. In chemistry certain substances may be brought into contact with one another without any chemical change; each substance remains exactly what it was before. There are others, however, which affect each other strongly. The chemical change which results is known as a *reaction*. Thus, if hydrochloric acid is poured on caustic potash, water and chloride of potassium are formed. Hydrochloric acid is HCl and caustic potash is KOH, and the combination may be expressed as KOH + HCl; while water is H₂O and chloride of potassium is KCl, and the combination may be written H₂O + KCl. The reaction may thus be expressed as KOH + HCl = H₂O + KCl. It is evident, now, that on each side of the equation there are two atoms of hydrogen (H), one atom of oxygen (O), one atom of potassium (K), and one atom of chlorine (Cl). See CHEMISTRY.

READE, read.

CHARLES (1814-1884). Novelist

After writing a number of plays, Reade found his true medium in the novel. His most popular work is the historical romance,



CHARLES READE

The Cloister and the Hearth (1861), but he also wrote several memorable books, such as *Hard Cash*, an exposure of private asylums, in which he drew attention to some of the most outstanding defects in the life of nineteenth-century England.

READING. A County Borough and the county town of Berkshire, situated at the confluence of the Rivers Kennet and Thames, and served by the G.W.R. main line from London to the West of England, with an area of 9105 acres and a population of 97,153 in 1931. Industrially, Reading owes its chief claim to fame by reason of its manufacture of biscuits, the factories of Messrs. Huntley & Palmer being the largest of their kind in Great Britain. In addition, it is a flourishing market town and a clearing-house for a large area of the Thames Valley. It has considerable engineering shops, is a centre of the brewing industry, and within its boundaries contains some of the largest seed-testing grounds in the kingdom. In addition, coach-building, several minor food manufactures, and, more recently, aeroplane building, are numbered among its commercial activities.

There is definite evidence of a pre-Roman settlement here, when beaver were common in the Kennet Valley. In Roman times several villas were built in the vicinity, but no organized town existed, so far as excavation has shown. In 1890 a pagan Saxon cemetery was found at King's Road, and further proof of a Saxon community is given under the year A.D. 871, in the *Anglo-Saxon Chronicle*, which tells of the Danish capture of the town. Queen Elfrida probably founded a nunnery at Reading in A.D. 979, possibly in the neighbourhood of St. Mary's Church. The Abbey, of which traces remain to day, was founded in 1121 by Henry I, who lies buried there. It possessed a relic in the reputed hand of St. James the Apostle. During the next century (1254) Reading received from Henry III its first charter. About the same time the famous *Rota Stanner is icumen in* was first written down at Reading Abbey. Archbishop Laud was born at Reading in 1573; seventy years later his master and friend, Charles I, vainly attempted to relieve the besieged Royalist garrison in the town. Its growth in the last hundred years has been continuous. A recent innovation has been the founding of Reading University, which obtained its Charter as a separate institution in 1926. It specializes in higher agricultural education.

The ruins of the Abbey are now fairly well preserved, although the facing of the walls has gone, leaving only the flint rubble core. Grey Friars in Friar Street incorporates some of the church of the Francis-

cans—which for some time was used as the Town Prison.

READING, RUFUS DANIEL ISAACS, FIRST MARQUESS OF (1860–1935). Statesman; his career has been one of the most romantic of modern times. He was born in London, the son of a Jewish fruit broker. In 1874 he ran away to sea. Returning home, he entered the University College school, and later attended school in Brussels and in Hanover. At 21 he became a stock-broker on the London Exchange, but proved unsuccessful.

In 1887 Reading was admitted to the bar, and immediately worked up a lucrative practice and gained a reputation for being a difficult opponent. His position as a lawyer was secure after 1901, when he convicted Whittaker Wright, the famous swindler.

In 1904 he was elected the Liberal Member of the House of Commons for Reading, so remaining until 1913, when he entered the House of Lords. In 1910 he was made Attorney General, and in 1912 entered the Cabinet, the first Attorney-General to do so. In 1913 Reading attained the highest judicial honour England offers when he became Lord Chief Justice, he was the first Jew to hold this position.

As Lord Chief Justice, perhaps the most difficult trial at which he had to preside was the Roger Casement trial for treason in 1910. The report of this trial—evidence of Lord Reading's ability, in a time of war and excitement, to remain calm, fair, and judicial.

In 1915, when the Allies needed more funds to carry on the war, Lord Reading, though remaining Lord Chief Justice, was released from his legal duties to go to the United States as president of the Anglo-French Loan Mission to procure a war loan. He returned to the United States again in 1917 as special envoy, and in 1918 succeeded Spring-Rice as high commissioner and special ambassador.

From 1921 until 1926 he was Viceroy and Governor-General of India. He found India in the midst of a social, religious, and financial crisis. When he left in 1926, he had given it a new and workable financial system, put the railways on a paying basis, set up a permanent tariff board, and made many warm friends among the Indians. He had



LORD READING
Photo Fox

endeavoured to conciliate Mahatma Gandhi, then leading his civil disobedience campaign, but had been obliged to imprison him, as well as the Ali brothers, Moslem leaders. He succeeded in securing some co-operation with the less intransigent native elements.

For his various services, Lord Reading was given many honours. He was made a baron in 1913, a viscount in 1916, an earl in 1917, and a marquess in 1926. He married, secondly, Miss Stella Charnaud in 1931.

REAGENTS. Substances used in chemistry to determine the nature or composition of another substance by means of their mutual chemical action. The term has been loosely applied to any chemical agent. See **CHEMISTRY**.

REAL ESTATE. See **PROPERTY, LAW OF**.

REALISM. In philosophy, a term describing, at different periods in its history, two distinct attitudes of investigation.

The first and most important interpretation is that put upon it by the medieval philosophers, who derived their beliefs from Greek philosophy as represented by Plato. In this case the term is employed as the antithesis of Nominalism. Plato asserted the reality of Universals; the "Ideas"—to him, and still more to his followers, the abstract, transcendental types of which all material objects are but imitations—had more reality than the material objects themselves. A slightly different viewpoint is that expressed by the theory that what is apprehended by the mind is more real than that which is apprehended by the senses, for whereas the senses are fallible, and deal only with appearances (a polished piece of wood has quite a different appearance in one light from what it has in another, yet it is the same piece of wood), pure thought is by definition incapable of error. So-called neo-Platonism extended the scope of the underlying ideas still further, and drew up a hierarchy of reality in which the universal abstract was the most real, the material particular least real. One of the best-known of the realist philosophers of the Middle Ages was Erigena, who supported and developed neo-Platonism on the basis of the reality of abstract class terms. For example, the idea "wild beast," as opposed to any particular beast, has true reality. By contrast, the Nominalists supported the contrary theory from the standpoint of common sense, asserting that the abstract universal has no existence apart from particular objects which make up the class and which alone are real.

In modern philosophy the term Realism is often used in a different sense, as opposed to Idealism. In this case the realist, such as J. Cooke Wilson, asserts the common-sense view that objects as apprehended are

real. The idealist, as represented by a large modern school of German philosophers, ultimately derives his theories from the difficulties raised by Descartes and his successors, who found the problem of the fallibility of the senses insoluble, and took up the position that objects perceived have, as far as we know, no real existence apart from being perceived. It is the cognition which gives them reality, and the existence of a mind which apprehends is the only reality which is demonstrably true.

REAPING MACHINE. Early types of reapers were all operated by manual labour. With the old hand sickle, a good reaper could reap an acre a day. Under modern



ANCIENT EGYPTIAN SICKLE, c. 2000 B.C.

It is made of wood, with a knife-edge of stone.

large-scale farming methods, such as are general in Canada, there would not today be sufficient labourers to effect the gathering of the harvest in the necessary time if a sickle were the only implement. The earliest workable type of reaping machine was invented by Rev. Patrick Bell of Forfarshire in 1826. McCormick, the American, produced an improved machine in 1831.

The modern harvester, or *self-binder*, has been developed from the original reaper. A canvas belt carries the grain over the main wheel to a box. From this box it was formerly taken and bound by men riding on a platform attached to the machine. Then came the knotting device. In the self binder, the canvas belt carries the grain to the binder head, where it is packed until there is enough for a bundle. Then a catch sets the knotting apparatus in motion, and the bundle is firmly bound with twine. An ordinary harvester requires three or four horses to operate it successfully, and it will harvest 10 to 15 acres of grain a day. On some of the largest farms, traction engines are used for operating the machines. It has been estimated that there are now over two million harvesting machines.



MODERN EIGHT-HORSE HARVESTER-THRESHER

The *combined harvester-thresher* is a machine that cuts and threshes the grain, all at one operation. It has a cutting mechanism very similar to that used on a self-binder. This mechanism is attached to the side of a small portable threshing

to harvest 400 or 500 acres of grain a year with a combine and a tractor.

REAR-ADMIRAL. See ADMIRAL.

REASON. See LOGIC.

RÉAUMUR, *ray o' mer*, **SCALE.** See THERMOMETER.

REBECCA. See ISAAC



SCYTHE WITH A CRADLE FITTING

machine, and a wide, endless canvas belt carries the unthreshed grain from the cutting mechanism directly to the threshing cylinder of the combine.

The "combine" marks almost as great an advantage over the self-binder as the self-binder did over the cradle and the flail. It is not uncommon for three or four people



REAPING WITH SCYTHES

REBELLION OF 1642. THE The complex causes of the Great Rebellion can be classed under the two heads of constitutional and religious problems. Constitutionally, the country was governed and laws were made by the King in Parliament. Under the Stuarts men were faced by the question, Crown and Parliament being at variance, which will should prevail? Study of the law gave little help, for copious precedent could be quoted on either side, strong monarchs having overridden Parliament and the weak or nervous having yielded much. James I had unwisely drawn criticism on his authority by claiming for it a theoretical basis, i.e. in divine right. To this theory were opposed precedents from the Lancastrian periods, sincere but fantastic mistranslations of Magna Charta. Each party regarded the other as revolutionary, seeking to alter the ancient ways.

The Stuarts were faced by prosperous self-confident, fiercely individualistic upper

and middle classes, with more than a smattering of law and an interest in affairs of state.

The religious problems were embittered by the fact that toleration was still regarded as a sin. Whoever controlled the state must persecute the other sects. The Church was essentially royalist and national; to those who loved her dignity and calm, the English Church and the English Throne seemed something closer than allies. The Presbyterian, regarding a priesthood as a barrier between God and man, would submit only to a council of elders and resented both King and bishop as checks to their authority. The Brownist or Independent, abhorring all ecclesiastical government, agreed only with the Presbyterians in opposition to the bishop and to the King behind the bishop. Both regarded the Anglican as one who was still tainted with Catholicism.

The weapon of the malcontent was economic. In a prosperous England the Crown was poor, for its income had been fixed since medieval days. In 1642 the confused quarrelling deepened into war, for the Commons, mistrusting Charles, were demanding powers that would have delivered England to a narrow oligarchy.

Although civil war divides families, a rough division of parties may be made. Parliament—still keeping the name, though now only two-thirds of the Commons and some peers—was supported by the middle-class, and therefore the great towns, the Puritan squires and many of the new nobility. The King could rely on the Anglican Church, the country gentry and the majority of the great houses. The Catholics were royalists. The labouring class fought only at their masters' bidding, knowing and caring little about either cause. The Roundheads could draw plentiful money and men from the wealthy South-East, and London was an abiding strength. They also had the fleet. From the wild North-West, Charles could raise men used to a hard, open-air life. His drawback was lack of money for powder and pay.

The Welsh were for the King, as were individual Irish, although Ireland was distracted with her own troubles. The Lowland Scots were inevitably sympathetic to their fellow Presbyterians, and the Highlanders, having not yet acquired a leader, were disregarded. Europe watched with interest, as indeed did the most part of Englishmen, of whom not three in a hundred bore arms.

The high commands were ill-organized. A Parliamentary Committee for long hampered its generals. Charles lost through his natural diffidence the advantage of absolute authority.

1642. London was the Roundhead centre, and in the autumn Charles marched against it from Shrewsbury. Essex from Worcester moved to its defence, and the first battle was fought at Edgehill, where Rupert's cavalry scattered the Roundhead wings but pursued till their horses were exhausted, leaving the main bodies to a grim but indecisive struggle. Essex retired on London on which the King eventually advanced, but Rupert was checked by Skippon's 'prentices at Turnham Green and the King fell back to Oxford. London would almost certainly have fallen and rebellion ceased had Charles won a victory at Edgehill, and probably if he had pressed on after the battle, as Rupert advised. The energy of both commands, however, was at first weakened by thoughts of compromise.

1643. Sir William Brereton defeated the Royalists at Nantwich, but was badly shaken at Hopton Moor. Lord Newcastle swept the North for the King as far as Newark, only the weaving towns holding out against him, and in June heavily defeated the Fairfaxes at Adwalton Moor, near Bradford. Meanwhile Sir Ralph Hopton had defeated Lord Stamford at Liskeard and overwhelmingly at Stratton, after which he cleared Devon of Roundheads and joined Lord Hertford. In July an indecisive fight against Sir William Waller at Lansdown Hill, near Bath, cost the life of Sir Bevil Grenville, to whose leadership of the Cornish much of the Royalist success had been due, but a week later Waller's force was shattered by Hopton and Prince Maurice at Roundway Down.

The main strategic plan of 1643 was a simultaneous closing on London from Lincolnshire, from Oxford and from the West, but it was ruined by lack of professional precision, by the distractions of relatively unimportant strongholds, and by the unwillingness of the levies to quit their own districts. Meanwhile the Eastern Counties had been firmly organized by Oliver Cromwell, and his cavalry at Gainsborough defeated that of Lord Charles Cavendish, who was killed.

Rupert had taken Birmingham and Lichfield and escorted to Oxford the Queen, who had been collecting money and munitions abroad. During the following months Reading was lost, retaken by the Royalists, and the indecisive Battle of Newbury fought.

In September, Parliament entered into the Solemn League and Covenant with the Scots, agreeing to the future supremacy of Presbyterianism and the present aid of Leven's well-trained troops. Pym, who had engineered this, died in December.

1644. Brereton, allied with Fairfax, won another victory at Nantwich, Monk among



SCENES FROM THE GREAT REBELLION
1. Part of Westminster, showing Parliament House, Westminster Hall and the Abbey, from an etching by Wenceslaus Hollar dated 1647. 2. Puritans and Cavaliers. 3. Charles unfurls his standard at Nottingham. 4. Battle of Edgehill. 5. Cromwell at Marston Moor. 6. The trial of Charles I. 7. The execution of the king.

Photos: British Museum; Norton

other prisoners joining the Parliament side. In June, Charles won at Cropredy Bridge a success rather than a victory. Rupert, who had relieved Newark and Lathom House, the latter gallantly held by the Countess of Derby, marched to aid Lord Newcastle, hard pressed by Manchester, Fairfax, and Leven. An unfortunately worded letter from Charles seemed a direct order to give battle. At Marston Moor he opposed far greater forces, nearly gaining victory in an ably conducted battle, but Cromwell, supported by the younger Leslie (see **LESLIE, GENERAL**), broke his forces in a cavalry charge, and the Royalist cause was ruined in the North.

In the South, Charles defeated Essex at Lostwithiel in Cornwall, and in October beat off far superior forces in the second Battle of Newbury. His escape owed much to the incompetence of Manchester, who was fiercely attacked in Parliament by Cromwell and removed, with Essex, by the Self-Denying Ordinance, in which all members of both Houses resigned army commands. Fairfax became Lord General and Cromwell was appointed later to command of the cavalry. By the end of the winter the Puritan redcoats of the New Model Army were efficiently organized.

1645. The winter and early spring saw the brilliant successes in the Highlands of Montrose (see **MONTROSE, DUKES OF**). Charles and Rupert, now Generalissimo, were brought to battle by the larger army of Fairfax at Naseby on 14th June. Rupert, on the right wing broke Ireton's cuirassiers, but Cromwell's cavalry was victorious on the other flank. The Royalist infantry were held by the Roundhead centre. Charles was about to lead his reserve of guards in a charge which might have brought victory, when his bridle was seized by Lord Carnwath, wild orders were shouted, and the furious King was swept helplessly away. Cromwell crushed the Royalist centre and Rupert's returning cavalry were scattered.

In September Rupert surrendered Bristol and Montrose was surprised at Philiphaugh. Parliament had triumphed and only the clearing-up was left. Lord Worcester held out at Basing House till October, and the minor actions at Bovey Tracey, Torrington, and Stow-in-the-Wold took place in the following spring. When Rupert yielded Oxford in June, Charles had already surrendered to the Scots.

Cromwell suppressed mutiny in the army, and then sailed to Ireland, where he crushed opposition; the massacres at Drogheda and Wexford proved the savage hatred borne towards the Catholic Irish. In 1650 Montrose sailed to Scotland, was captured and

hanged, but his enemies made peace with Charles II, who accepted the Covenants and landed in June. Cromwell went north. He was outmanoeuvred by David Leslie, but defeated him at Dunbar. In 1651 Charles II invaded England, but hatred of the Scots kept recruits from joining him, and his army was defeated at Worcester. This was the last battle of the Great Rebellion.

RECEIPT, *re seel'*. A receipt is a written acknowledgment of the payment of money or of any property named in the receipt. A receipt should always show whether payment is made in full, on account, or on the special account to which the payment is applied, when there is more than one account between the parties. A receipt should be given whenever an account is paid. An invoice marked "paid" and properly signed constitutes a receipt. Under English law, in all cases where the sum received is £2 or more, the receipt must bear ordinary postage stamps of 2d in value, and the stamp or stamps must be cancelled by the receiver writing either the date or his name across them. If any person gives a receipt which is liable to stamp duty without its being stamped, or refuses to give a properly stamped receipt when such is necessary to comply with the law, or otherwise evades the payment of the duty, he is liable to a fine of £10. Should a receipt be issued unstamped in error, it may within a month have a stamp impressed on payment of a penalty.

RECEIVER. In law, this name is given to a person who is appointed by a court, or by persons interested in the preservation of property in order to gather in income or to realize property. A receiver is commonly appointed by a court to preserve property which is the subject of litigation, but the High Court has a very wide power of appointing a receiver, "in all cases in which it shall appear to the Court to be just or convenient that such an order shall be made." Mortgagees and debenture-holders often have power to appoint a receiver of the property concerned. A receiver may also be empowered to act as manager, that is, to carry on a business as a going concern.

RECEIVING ORDER. See **BANKRUPT**.
RECEIVING STOLEN PROPERTY. Every person who receives any property knowing it to have been stolen or otherwise criminally obtained (for example, property embezzled or obtained by false pretences) is guilty of a criminal offence. If the principal offence was a felony, the receiver is guilty of felony and liable to fourteen years penal servitude, if the principal offence was a misdemeanour, the receiver is guilty of a misdemeanour and liable to seven years penal servitude. In a trial for receiving, it is

necessary to prove that the property was stolen or otherwise criminally obtained (the circumstances in which the prisoner received it may be evidence of this), that the prisoner received it into his possession, and that he knew at that time that it had been criminally obtained. It is always permissible in a trial for receiving to bring evidence that the prisoner has, within the five preceding years, been convicted of any offence involving fraud or dishonesty, or that other property stolen within the preceding twelve months has been in his possession.

RECENT PERIOD. See QUATERNARY PERIOD.

RECIFE, *ray se' feh.* The local name of the city of Pernambuco. See BRAZIL.

RECIPROCITY, *res si pros' iti.* A term which, in a broad sense, means exacting and giving equivalent treatment, but as used in connection with tariff legislation, the word has acquired a special meaning. It refers to the policy of advancing international trade by means of treaties which grant mutual trade concessions. See TARIFF.

RECLAMATION OF LAND. The drainage and recovery for agricultural or other use of land submerged by water. This has been



LAND RECLAMATION

Planting reeds which spread rapidly and by collecting soil particles raise the ground level

Photo: Fox

carried out on a small scale in numerous areas, and several very large ventures—including the embanking and drainage of the Zuider Zee and the conversion of the Pontine Marshes into farmland—have been undertaken. In America the term is used more loosely and is taken to include irrigation of barren areas. See DRAINAGE.

RECOGNIZANCE, *re kog' niz ans.* In law, the term denoting a solemn written undertaking whereby a person acknowledges before

a court or authorized officer that he is liable to pay a certain sum to the Crown, his liability to cease if he carries out the order of the Court.

Recognizances are used for various purposes. Thus a person arrested is often released pending trial, if he, or others on his behalf, enter into a recognizance that he will appear for trial when required (see BAIL); and a person who has been found guilty of a breach of the peace may, either in addition to or instead of any other punishment, be required to give recognizances that he will keep the peace during a specified time. Similar recognizances may also be required of a person who has not committed a breach of the peace but whose conduct makes it appear likely that he will do so or incite others to do so. If the undertaking is not kept, the recognizance is "estreated" (i.e. forfeited).

RECORDER. See FLUTE.

RECORDER. In law, the judge of a Borough Court of Quarter Sessions (see QUARTER SESSIONS). Recorders are appointed by the King on the recommendation of the Home Secretary. Appointees must be barristers of at least five years standing. Their salary is fixed by the King but must not exceed the amount named in the petition presented by the borough, as a result of which the Borough Court of Quarter Sessions was established. A Recorder has precedence in his borough next after the mayor.

RECORD OFFICE, PUBLIC. A large building in Chancery Lane, London, where records of legal proceedings and public transactions are preserved. The Record Office was first established in 1538, and was at first used almost exclusively for Court records, which before that time had been stored at numerous different places, such as the Tower of London, the Chapter House of Westminster Abbey, the Rolls Chapel, and other ancient buildings. In 1852 the use of the Record Office was extended by bringing there other State papers besides those relating to Court proceedings. Again in 1903 the Land Revenue Records were transferred there. The total number of documents preserved is enormous, and extends back over more than 800 years. The chief officer of the Record Office is the Master of the Rolls, who is assisted by a Deputy Keeper of the Records. See DOMESDAY BOOK, ROLLS, MASTER OF THE.

RECTANGLE. A type of plane figure having four straight sides, whose opposite sides are parallel and therefore equal, and whose angles are right angles. Thus the term is a more restricted one than *parallelogram*: *rectangle* means, literally, "right-angle." If the four sides of a rectangle are

equal, the figure is a square. See **QUADRILATERAL**.

RECTOR. The incumbent of a parish, i.e. the holder of a parochial benefice and of the properties connected with it, namely, the freehold of the church, churchyard, house, glebelands and buildings, is called the Rector if he is in possession of all these emoluments, which are vested in him by institution and induction.

The term rector is also sometimes used of the principals of places of learning such as universities or colleges.

RECTUM. See **INTESTINE**.

RED. Of the seven colours of the solar spectrum, red is the least capable of being refracted, and the one having the longest wave-lengths. According to the common theory of colour, red is one of the three primaries, and green is its complement. Red is the colour most easily seen.

Among the best-known red colouring-matters are carmine, vermilion, red ochres, madders, and certain coal-tar products. See **COLOUR**; **LIGHT**; **SPECTRUM**; **ANALYSIS**.

RED ADMIRAL. A fairly common butterfly in southern England. The red band and black tip with white spots on the fore-wing, and the red margin with black spots on the hind wings make its identification fairly easy. It appears generally in late summer and early autumn and may be found most commonly in the vicinity of ivy. The caterpillar is yellow-striped and is found on nettles. For illustration, see coloured plate, "British Butterflies."

Scientific Name. *Pyramus atalanda*

REDBREAST, or "ROBIN" REDBREAST. A common and very popular bird

in most European countries. The name is derived from its orange-red breast, and its popularity arises from its self-assurance and sociability and the confidence it displays in man. Contrary to popular belief the robin is migratory, and those found in



ROBIN REDBREAST
Photo: E. J. Hocking

winter in any particular district are generally not those which have nested there during the summer but others which have migrated from breeding grounds farther north. See **ROBIN**.

Scientific Name. Robins belong to the family *Muscicapidae*. Specific name: *Erithacus rubecula*.

RED CEDAR. See **JUNIPER**.

RED CROSS. Throughout nearly the whole world the Red Cross organization prepares voluntary societies and individual volunteers for the assistance and relief of those wounded on the battlefields, providing nursing and medical care. By international arrangement, the emblem—a Red Cross on a white ground—has to be, and usually has been, protected from aggression. This great world agency was initiated in 1862 by Henry Durant, who at Geneva in that year published a booklet entitled *Un Souvenir de Solferino*. His distress at witnessing terrible scenes of suffering in the Italian war caused him to write this book, urging the necessity for establishing permanent societies for the aid of the war wounded. His appeal caused the Société Genevoise d'Utilité Publique to invite him to explain his plans in detail at one of its meetings. There followed the establishment of the Comité International de la Croix-Rouge. Plans for the formation of national committees to aid army medical services by voluntary corps were embodied in a draft agreement; and an international meeting was called to discuss this agreement at Geneva, 26th to 29th October, 1863. The delegates set out the fundamental principles of the Red Cross. Next was secured international legal status for the movement, ensuring to the wounded, their aids and medical supplies, immunity from attack and a single recognized emblem—the Red Cross—to be used and regarded by all nations (among Mohammedan nations the Red Crescent is used). The Geneva Convention of 26th August, 1864, endorsed these proposals. That Convention was revised and completed by a further Convention at Geneva on 12th July, 1906. Sixty nations throughout the world now endorse the Convention provisions.

REDFISH. The name applied to several fishes, particularly to the *red drum*, or *channel bass*, a game fish abundant in the western Atlantic coast waters.

Redfish is also the Alaskan name for the red or blue-black salmon.

Scientific Name. The red drum is *Sciaenops ocellatus*.

RED INDIANS. See **INDIANS, AMERICAN**.

REDMOND, JOHN EDWARD (1851–1918). An Irish political leader, born at Waterford and educated at Trinity College, Dublin. He studied law and was called to the Bar in 1886, five years after his election to Parliament. On Parnell's death, Redmond became head of the Parnellites, and as such kept up a bitter antagonism to the other section of the Irish party. In 1900, however, when the

two sections joined to form a new Nationalist party, he became the accepted leader.

The General Election of 1910 so reduced the great Liberal majority that Redmond controlled the situation, for the combined Irish and Unionist vote would have defeated the Government. Knowing the Upper House to be opposed to Home Rule, he pressed on the Parliament Act of 1911. When the Home Rule Bill was introduced in 1912 he secured its acceptance by the Irish Nationalists. He was a member of the Conference at Buckingham Palace called by King George V in July, 1914.

On the outbreak of the World War he declared that the regular troops might be



JOHN REDMOND
Photo: Brown Bros

withdrawn from Ireland, which would be defended by Nationalist and Ulster volunteers. The grateful Government passed the Home Rule Bill, but suspended it until the war should end. Redmond aided recruiting in Ireland, although he was opposed to conscription.

In 1915 Redmond was offered a place in the English Coalition Cabinet, formed

for more effective prosecution of the war, but he declined. After the Dublin rebellion of 1916, he offered to help in an attempt to reach a settlement. The attempt failed, but in 1917 an Irish convention was called by Lloyd George, and in this convention, Redmond played an important part. See HOME RULE; IRELAND; PARNELL, CHARLES STEWART.

RED MULLET. Common in the Mediterranean, the red mullet is seldom seen in British waters outside the Channel. It is an excellent food fish and easily distinguished by the colour which gives it its name and by the spiny first dorsal fin. It is a shoal fish, and numerous off English south-coast resorts at certain seasons.

Scientific Name. *Mullus surmuletus*.

REDPOLL. A common name for several related birds which are characterized by a patch of red on the front of the head. Redpolls are small birds belonging to the finch family, which have a characteristically thick beak and live mainly on seeds. The redpolls are related to the siskin, goldfinch, etc. The mealy redpoll is a winter visitor to the British Isles, but the lesser redpoll is found all the year round in most districts.

Scientific Names. Redpolls belong to the family *Fringillidae*. The mealy redpoll is *Carduelis linaria linaria*. The lesser redpoll is *C. linaria calear.*

REDRUTH, red rooth'. See CORNWALL.

RED SEA. An arm of the Indian Ocean, about 1200 miles long, which separates the Arabian Peninsula from North-eastern Africa. Since the construction of the Suez Canal (which see), the Red Sea has been the great water highway between Europe and the Orient. It has many disadvantages as a trade route, because, except for a broad central channel, the sea is dangerous even to small vessels; the atmosphere is damp and made intensely hot by the burning winds off the African desert; yet, were it not for this passage, the enormous volume of trade between the European countries and Japan, China, and India would follow an overland route, as it did centuries ago, or proceed by way of the Cape of Good Hope. The sea is long and narrow, never exceeding 200 miles in width, and its average depth is about 2000 ft.

Geologically, the Red Sea is an area of subsidence between parallel faults. The shores are barren, and there are few harbours. On the east are high mountain ranges, on the west, low sandhills and rocky tablelands, skirted by numerous reefs. Because of the great evaporation resulting from high winds and the excessive heat, usually above 100°, the Red Sea waters are very salt.

REDSHANK. One of a large group of birds very similar in appearance, and which are included under the common name of



REDSHANK ABOUT TO BROOD
Photo: John Kearton

waders. The majority are found on the shores of seas or inland waters or in marshy places, are long-legged and generally web-footed. The long red legs of the redshank give it an unmistakable appearance.

Species of redshank are found throughout

Europe and Asia. The majority migrate to the south in winter.

Scientific Name. The common redstart is *Tringa totanus*.

REDSTART. This name is derived from an old English word meaning Red-tail, and is used as the common name for the members

of a large genus of birds which have a red tail, most conspicuous when in flight. Redstarts are closely allied to the nightingale, robin, blue throat, etc., and many species are found scattered throughout the Old World. The common British redstart is a summer visitor which



COCK REDSTART
Photo: E. J. Hosking

spends the winter near the tropics. The male has a white forehead, black throat, and dull red breast. An allied species, the black redstart, is very common on the Continent and is often seen in Britain, particularly in spring and autumn. The male has no white forehead and is darker on the throat and chest, having a conspicuous white patch on the wing.

Scientific Names. Redstarts belong to the family *Muscicapidae*. The common British redstart is *Phoenicurus phoenicurus*, the black redstart is *P. ochurus*.

REDWING. A bird of the thrush genus, in size and general appearance it is very similar to the other thrushes. It can be distinguished in flight by the reddish colour of the flanks and underwing, and at rest by the light-coloured streak over the eye.

The redwing breeds in north-west Europe, but is only a winter visitor to Britain.

Scientific Name. The redwing is *Turdus musicus*.

REDWOOD. A giant cone-bearing tree of the western United States. See *SEQUOIA*.

REED-BUNTING. A bird of the bunting tribe which is found in marshy districts in central Europe. In Britain it is a common breeding bird in suitable localities and is easily distinguished by the black head and throat and white colour of the male. In the female the head is brown, but the outer tail feathers are conspicuously white.

Scientific Names. The family is *Fringillidae*, and the genus *Emberiza schoeniclus*.

REEVE. The female ruff. See *RUFF*.

REFEREE, OFFICIAL. An officer attached to the High Court of Justice, and uniting the functions of an arbitrator with those of assistant judge. As an arbitrator, an Official Referee can be called in only by mutual consent of the parties to a dispute. As an assistant judge, he is brought into a case by order of the Court which is trying it. His duty in such a case may be either to take certain accounts or to conduct some inquiry and report his findings to the Court, or to take over the whole trial of the action and issue a decision which will then have the force of a judgment of the Court.

There are three Official Referees.

REFERENDUM. The taking of a vote of the people on any specific legislative measure which has been passed by a city council or state parliament. The Initiative, which is closely associated with the referendum, is a device whereby a group of persons may draft a proposed law and have the right, if they are supported in sufficient numbers, to have their proposal submitted direct to the voters for acceptance or rejection. From the earliest times the initiative and referendum have been part of the Constitution of the Cantons of Switzerland. In recent times several American states have authorized both devices as part of the regular instruments of law-making. In many European countries the referendum is used for some purposes. In Australia, New Zealand, and Canada the referendum has been utilized frequently, and it is a part of the Constitution of the Irish Free State.

REFINING. See *METALLURGY*; *PETROLEUM*.



REDWING AT NEST
Photo: John Kearson

REFLECTION. A rubber ball thrown against a wall will bound back into the space through which it came. This statement illustrates concretely what happens when a

ray of light, heat, or sound (a wave of radiant energy) strikes upon a surface; it is turned back, or *reflected*. The angle at which a wave of radiant energy strikes a surface is called the *angle of incidence*, and the angle at which it is turned back is the *angle of reflection*. These angles are equal. See ECHO; LIGHT; SOUND.

REFLEX ACTION. A reflex action is a muscular or glandular response to the stimulation of a sense organ, which occurs involuntarily. The knee-jerk, blinking, coughing, sneezing, and the contraction of the pupil in bright light are among familiar reflexes. When a reflex action occurs, the subject may or may not be conscious of it. When we cough we are conscious of it. We are not conscious of the contraction of the pupil of the eye. Mostly we are quite unconscious of blinking or of the beating of the heart, but we may become conscious of these reflexes under abnormal conditions.

The nervous mechanism for reflex action may be of a comparatively simple kind (see NERVOUS SYSTEM). In the spinal reflexes, this consists of nerves to and from and within the spinal cord. Thus it is possible to induce spinal reflexes in an animal after all connection with the brain has been severed.

REFORM ACTS. The name generally given to legislative acts which have modified the constitution of the British Parliament, in particular of the House of Commons, and have affected the possession and exercise of the parliamentary franchise.

Prior to 1832, the right to send representatives to the House of Commons was shared by Counties and Parliamentary Boroughs. The county franchise was possessed by all freeholders who owned land of the annual value of 40s. and upward. Voting took place at the County Courts, and those freeholders who were present elected two knights of the Shire to represent them. The borough franchise was regulated on no such uniform principle. In some boroughs the voting was in the hands of the mayor and corporation, in others in the hands of the freemen, or some other limited class of persons. Moreover, the only towns which had the right of sending members to Parliament were those upon which the status of a borough had been conferred by Royal Charter. Some ancient boroughs had in process of time shrunk to the size of villages, and were entirely owned or controlled by one landowner, who thus acquired the power of nominating a member for Parliament. These boroughs were known as "rotten" or "pocket" boroughs.

John Wilkes in 1776 advocated the disfranchisement of the "rotten" boroughs, and the younger Pitt also proposed measures

of reform. But the reaction which ensued on the excesses of the French Revolution checked the movement for a generation. Reform Bills were introduced into the later parliaments of George IV, but did not withstand the opposition of the Duke of Wellington and the Tories. The popular clamour in favour of reform, greatly encouraged by the constitutional revolution in France (the "July Revolution"), finally brought about the fall of Wellington's ministry in 1830, and after a further struggle between the Lords and the Commons, the former, threatened with an influx of new peers, yielded, and the First Reform Bill, introduced by Lord John Russell during Earl Grey's ministry, became law in 1832.

By this Act changes were made both in the franchise qualifications and in the distribution of seats. In the counties the 40s. freehold franchise was extended to other substantial occupiers of property who were not freeholders. In the boroughs there was to be one uniform qualification, viz. the occupation of premises worth £10 a year.

The Act disfranchised 56 boroughs altogether and reduced the representation of 32 others by one member each. These seats were transferred to previously unrepresented or under-represented counties and towns (e.g. Birmingham and Manchester).

The Act of 1832 did not satisfy the more radical reformers, and agitation for a further measure of reform went on. The Second Reform Act of 1867 enfranchised the town artisan. In boroughs, all householders paying rates, and lodgers paying at least £10 rent, received the franchise. In counties, the occupation of property worth £12 a year carried the right of voting. The Act also carried redistribution a step farther, forty-six seats being transferred from the smaller to the larger towns. The effect of the Act was seen in a great outburst of activity in social and industrial legislation.

Next was the Third Reform Act (1884), which placed the county franchise on the same basis of household suffrage as the borough franchise and added a service qualification. Redistribution was effected by a separate measure in 1885. While the Act of 1832 enfranchised about half a million citizens, the Act of 1867 added a million, and the Act of 1884 two million electors.

In 1918 the agitation for Women's Suffrage, won its first success. The Reform Act of that year granted votes to women who had reached the age of 30, and at the same time conceded the principle of Manhood Suffrage. The old franchises were replaced by a simple qualification based on residence or on occupation of business premises. The Fourth Reform Act added some 8,000,000

persons to the electorate. In the same year a short Bill was passed removing the disqualification of women from election to the House of Commons.

Ten years later (1928) the Fifth Reform Act brought the franchise qualifications of men and women into line, and thus established adult suffrage on the widest possible basis. The electoral franchise now arises from (a) residence; (b) occupation of business premises of £10 annual value; (c) being husband or wife of such business occupier; (d) being a university graduate. See PARLIAMENT; PROPORTIONAL REPRESENTATION.

REFORMATION. The sudden great movements of history always have their roots in the thoughts, aspirations and discontents of past generations. The Reformation, the vast religious upheaval of the sixteenth century, which changed the face of Europe, is no exception to this rule. The claims of some of the less spiritual of the Popes to temporal sovereignty over the world, which lost them the support of kings and princes; the fixed taxes for the support of the Church, which were a heavy burden; the want of instruction among the people; and the low level of Christian practice and morality in many religious houses and among the secular clergy, had combined with other causes for many generations to weaken the hold of the Catholic system on the minds of critical thinkers and the hearts of the less instructed. The Renaissance, also, with its rediscovery of the old pagan philosophies and culture, had opened men's minds to a wider and more liberal thought. Though an orthodox theologian, the scholar Erasmus prepared the way for the Reformation by his unsparing satire on contemporary abuses—which others brought into the sphere of active protest—and by his classical humanism, with its destructive criticism of medieval standards of thought.

When, therefore, Martin Luther, monk, scholar and born leader of a cause, nailed his famous theses on the Church door at Wittenberg in 1517, to protest against an abuse of religion in the selling of indulgences, he set the spark to a train already laid for

the explosion, which eventually cut off nearly the whole of Northern Europe from the papal allegiance. This action has gone down to history as the starting-point of the Reformation. The movement established itself according to two differing trends of theological thought. Lutheranism was confined mainly to Germany, but Calvinism was destined to pass to more distant fields and to capture the allegiance of diverse peoples.

Lutheranism. Luther's protest at Wittenberg was against a single abuse, but it was not long before he found himself in acute conflict with the whole doctrinal and administrative position of Rome, including papal supremacy, clerical privileges and Roman teaching on purgatory and remission

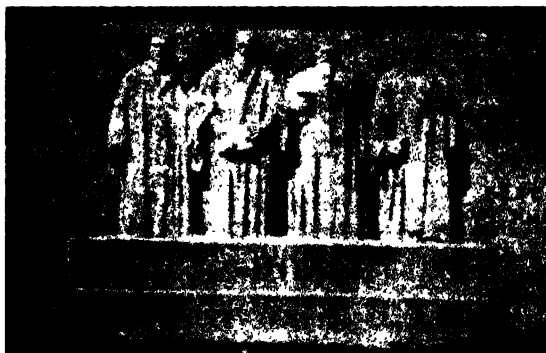
of sin. Like the other reformers who followed him, he advocated a return to the simple doctrine and discipline of primitive times, and reliance on the Bible as the sole guide to religious truth.

In 1520 Pope Leo X issued a Bull condemning a number of Luther's propositions. Luther burned the Bull after appealing

for a General Council. His excommunication followed in 1521. In the same year Luther appeared before the Diet of Worms, refused to retract his opinion, and sought the powerful aid of Frederick, Elector of Saxony, who welcomed his teachings—for he himself was at loggerheads with the new Emperor, Charles V—and protected his person.

Thenceforward the spread of Lutheranism in Germany was very rapid. It was readily adopted by the people, and fostered for political reasons by the princes of various states, who were glad to free themselves from papal exactions and found a new source of wealth in seizing the property of the Church in their dominions. The outstanding features of the progress of Lutheranism in Germany are the Diet of Speyer, the Confession of Augsburg (1530), the formation of the League of Schmalkald, the Diet of Augsburg (1555), and the Thirty Years War.

Speyer (1529), where the Roman Catholic princes tried to force their principles upon



LEADERS OF THE REFORMATION

Left to right. Calvin, Farel, Beza and Knox. A section of the monument of the Reformation at Geneva

Photo ORU



JOHN KNOX REPROVING THE LADIES OF THE COURT
(From a painting by Ibbotson.)
Photo: Mansell



CHARACTERS OF THE ENGLISH REFORMATION
From left to right: Hooper, Ridley, Latimer, Cranmer, Bradford and Taylor. The reproduction is from
an old print.
Photo: Mansell

the reforming minority, which refused and *protested*, gave the name Protestant to the new movement. In 1530 a Protestant "Confession" was presented to Charles V at Augsburg, in which Melancthon, the co-adjutor of Luther and a moderate Protestant, had summarized the reformed doctrines. The League of Schmalkald was formed by the Protestant princes to resist an Edict of the Emperor ruling that no action should take place in the reforming interests, until the assembling of a General Council. War

of the kingdom of Denmark, then united with Norway as one realm.

Calvinism. Lutheranism had thus won its position in Germany and the Scandinavian kingdoms. But in the meantime a similar movement had been going on in Switzerland, though with a different theological basis. Ulrich Zwingli of Zurich preached reforming doctrines as early as 1518, but he was killed in 1531, and the chief force of the Swiss movement came to be directed by John Calvin, an exiled Frenchman. The



MONUMENT OF THE REFORMATION

A bas relief at Geneva, depicting Henry IV of France signing the Edict of Nantes in 1598. The inscription is in English, French (part of which is shown), German, Greek and Latin.

Photo: OROC

followed, and the League was heavily defeated in 1546. Nine years later, however, the Diet of Augsburg decided that each state should be free to choose its own religion; but this peaceful solution was not finally attained until the Peace of Westphalia, which ended the sanguinary struggle of the Thirty Years War (1618-1648).

While the battle for the new doctrine was going on in Germany, it was natural that it should be carried northward to the contiguous countries of Denmark, Norway and Sweden. This was done by apostles of the reformed faith, and Lutheranism established itself—keeping, however, rather more of the externals of Catholic worship—in all three countries. In Sweden the Augsburg teachings had been adopted in 1527; in 1546, at a Diet held in Copenhagen, the Lutheran religion was settled as the faith

teaching and influence of this famous religious leader had a profound effect, not only on Switzerland but in countries as removed from it, or unlike it, as Scotland and the Netherlands. Calvin's teaching, and the Presbyterian system of Church government inaugurated by him, have been accepted in varying degrees in France, Holland, Scotland, Northern Ireland, England, and America.

It was likely that the doctrines of Calvin—himself a Frenchman—should make themselves felt in France, and they made a certain amount of headway there, principally among the upper classes. French Calvinists suffered much persecution in the earlier stages of the movement. But the Huguenot party—the name by which the French Protestants came to be known—tended more and more to be a political rather than



CRANMER AT TRAITOR'S GATE
(From a painting by Goodall)

Photo Mansell



LUTHER PREACHING
(From a manuscript of his prayers)

Photo: Mansell

a purely religious organization, and the struggles between the Catholics and the Huguenots tore France with civil war for many years. The Edict of Nantes in the reign of Henry IV secured a religious toleration which was violated by Louis XIV. Freedom was gained later, but France has remained essentially a Catholic country, containing but a small proportion of Calvinistic Protestants.

The heroic struggle of the people of the Netherlands to secure their independence was to a considerable extent inspired by their acceptance of the Calvinistic doctrines. The fierce persecution by Philip of Spain with the ensuing desperate conflict which is one of the most stirring struggles for liberty in history, ended at last in victory for political and religious freedom.

In the British Isles, Scotland; under the influence of John Knox, who was upheld by a powerful faction of the nobility for political reasons, adopted Calvinism, and became and still remains, largely Presbyterian. From Scotland, Presbyterianism penetrated to Northern Ireland.

The Reformation in England is usually said to have begun with the quarrel of Henry VIII with the Pope, but Henry was no Protestant, and during his reign many upholders of the new teaching were martyred. In the reign of Edward VI it suited the policy of the Government to support Genevan principles, in order to make excuse for robbing the Church of its possessions. Mary

brought back the Roman obedience and martyred the Protestants. The reign of Elizabeth saw a complete break with Rome, persecution of those who refused to conform, and a policy which steered the Church on a middle course between Roman Catholicism and Calvinism.

The conflict between tradition and innovation, based more or less upon Geneva, during the reigns of the first two Stuarts and the Protectorate, ended, after the restoration of Charles II, in the re-emergence of the Church of England, no longer holding to certain practices and beliefs which it held to be errors of Rome, but claiming to be in orders and faith the original Church of the land. Genevan doctrine and organization were left to those dissenters who upheld the principles of Presbyterianism (see PRESBYTERIAN CHURCH) and came to be classed among the "Nonconformists."

The results of the Reformation will necessarily be estimated according to the religious predispositions of the critic. Roman Catholic historians readily admit that the Church needed disciplinary and moral reformation in Luther's time, but say that the reformers achieved their success at the price of separation from the Apostolic Church, and the founding of new bodies of Christians, whose tendency has been to split up into differing groups with opposing doctrines, thus increasing the divisions of Christendom.

The Protestant, on the other hand, will argue that the need for reform was long overdue, and that the Reformation brought in its train religious liberty, the open Bible, and a religion more in accord with the primitive model of the New Testament. See CALVIN, ERASMUS, LUTHER, MELANCTHON, etc.

REFORMATORY SCHOOLS AND INDUSTRIAL SCHOOLS. Institutions for the education of boys and girls who need corrective influences. Reformatory education is usually resorted to after the efforts of home, school, and juvenile court have proved inadequate to restrain the tendency to crime. Separate institutions are maintained for boys and girls, but the aims of the two are similar--the development of character rather than the infliction of punishment. All are taught occupations and trades, with the idea of diverting the mind into constructive channels. A *Reformatory School* in Britain is one to which are sent for training youthful offenders between the ages of 12 and 16 who are guilty of offences which are punishable, in the case of an adult, by penal servitude or imprisonment. An *Industrial School* is intended for the training up to 14 years of age of children who may not have actually

committed any offence but whose circumstances may lead them to join the delinquents. A *Day Industrial School* is one where lodging is not provided.

All these schools are voluntary, conducted by associations or local authorities. Treasury grants-in-aid are made on the recommendation of the Home Secretary, who appoints inspectors. By the Children and Young Persons Act, 1933, the terms "Reformatory" and "Industrial" are abolished and the institutions are all known as *Approved Schools*, the Home Secretary classifying them according to the needs of the pupils.

REFRACTION. See LIGHT; OPTICS.

REFRIGERATION, *re frij er ay' sh'n*. A lowering of temperature in an airtight container, which may be as small as the popular gas or electric refrigerators, or as large as a cold-storage building. Refrigeration is a process; cold storage is also a process, but one which has grown to a business of vast proportions.

The old-fashioned ice-box system, formerly the only means of cooling, is being rapidly supplanted by a chemical and mechanical process.

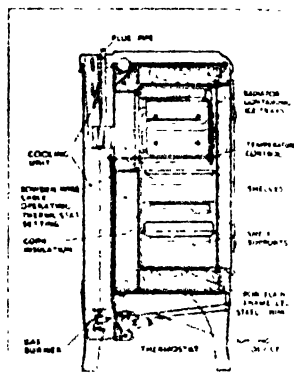


DIAGRAM OF GAS REFRIGERATION
(Courtesy, Electrolux)

It is known that bacteria, the greatest factor in the spoiling of food, multiply rapidly in temperatures above 50° F., and that their growth is checked at temperature below 50° F. Moisture aids the growth of bacteria and mildew, and also transmits odours from one food to another. Modern refrigeration provides temperatures always between 30° and 50° F., and air so dry that odours are not transmitted. With the ice box, temperatures are rarely obtained below 52° in summer, and the air inside is naturally moist.

In general, the process of modern refrigeration is simple, and is based on the natural law that, when matter changes from a liquid to a gaseous state or vice versa, it absorbs or gives off heat, as the case may be. This law, as applied to refrigeration, calls for a liquid refrigerant which boils at a very low temperature, and which may be recondensed at a correspondingly low pressure. Sulphur dioxide, which boils at 14° F., is the best-

known and most generally used of the various liquids. In the commonest process, the refrigerant flows under pressure to the cooling coil in the refrigerator as a liquid. In the cooling coil, pressure is released, and the liquid is free to expand into a gas and absorb heat from the air in the refrigerator. The gas, carrying the heat with it, is pumped back to the compressor, where it is recondensed, and the heat is thrown off into the surrounding air. It is now in a liquid state, and ready to go through the same cycle again.

A good refrigerating mechanism is entirely automatic, and maintains uniform temperatures, summer and winter, without adjustment. It never needs recharging with refrigerant. Electricity or gas is used to work a modern refrigerating machine.

Sulphur dioxide is regarded as one of the safest possible refrigerants, because prompt warning is given of any leakage of the gas by an unmistakable odour. On many railways to-day, special refrigerator trucks are run for the conveyance of meat and other perishable goods. The majority of these trucks are cooled by ice in receptacles at either end or under the roof. The waggons themselves are waterproof and airtight. See ICE.

REGENERATION. In regard to the application of the word "regeneration" to that term of tissue renewal referred to by Huxley and demonstrated in the lowest forms of crustacean and reptile life (e.g. crabs losing new claws, lizards new tails), the process is a provision of Nature whose least development is in mankind; its fullest development is, curiously, in inverse ratio to the importance of the subject. Mankind loses hair, the hair grows again; cuts nails, the nails grow again; loses skin by sunburn or scalding, new skin grows. Such processes are described by biologists as regeneration. Mankind, however, loses a finger or toe or a limb, another never grows. So with animals; but Nature does provide them with the faculty to renew the tissues of the body which are subject to wear and tear. This is physiological regeneration—animals and birds moult, the cells damaged by wear and tear are renewed naturally. It is only with the lower animals such as reptiles, snakes and newts that a lost claw, limb, or tail is also renewed by Nature. The mythical Greek story of the hydra serpent killed by Hercules is based on fact. In many crustacea the replacements only occur in exceptional circumstances. Worms cut into pieces replace their form when each cut piece contains a bit of nucleus, not otherwise, so with starfish. Similar renewals and transformations occur after injury to the eyestalks of snails, the legs of spiders, and

parts of many fish, insects, and reptiles. Young insects are the most successful "regenerators."

REGENT. Title of one who assumes the administration of State affairs when the rightful sovereign is under age, absent, or unable to fill the office in person. In hereditary monarchies, this office is generally held by the nearest relative of the King or Queen who is capable of exercising authority, or by a council.

In 1810 George III of England became permanently insane and George, Prince of Wales, became Regent until his own accession in 1820. This period is known as the "Regency."

Derivation. The word is derived from the Latin *regere*, to rule.

REGICIDES, *rej' i sidz*. In a broad sense, persons who assassinate, or plot against the life of, a king. Specifically, the term is used of the English officials responsible for the death of Charles I.

REGIMENT (Latin *regimen*, a row or rank). A term denoting a body of troops. The name when first used, about the end of the sixteenth century, referred to any body of troops commanded by one man, and not to a definite number of men. To-day, the size of a regiment varies in the world's armies.

In the British Army, *regiment* is applicable to a cavalry unit, and to the artillery, or linked battalions of infantry, when referred to as a whole. A British cavalry regiment consists of headquarters, headquarter squadron, and three sabre squadrons, each of four troops. It is commanded by a Lieutenant-Colonel.

A regiment of guards or infantry of the line may consist of from one to three battalions of regulars, with as many as five Territorial Army battalions in the case of infantry of the line.

A regiment of British infantry has no executive commander; it may have the King as *Colonel in Chief*, or a retired or serving officer as *Colonel of the Regiment*.

A regimental depot, situated in the county in which the corps is raised, is usually allotted to each regiment.

REGISTRATION. Many countries provide for the recording in public registers of births, marriages and deaths (these records are called *vital statistics*) and of other matters. In Great Britain the most important registers are those of births, marriages and deaths, of companies, trade unions, friendly societies, of persons qualified to practise certain professions (e.g. doctors), of patents and trade-marks, of bills of sale, of wills, of certain third-party interests in land, and (in Scotland, but only in a few parts of England) of titles to land.

Registration of Births, Marriages and Deaths. Since 1874 registration has been compulsory. Records are kept at the General Register Office under the supervision of the Registrar General. For the convenience of the public, the country is divided into districts and sub-districts, in each of which there is an office at which registration may be made. Every birth, including still-births, must be registered within 42 days.

Church of England marriages must be registered by the clergyman before whom the marriage was solemnized; Nonconformist marriages in a registered building must be registered by the registrar or by the person appointed for the purpose by the governing body of the building; marriages according to the usages of the Society of Friends must be registered by the registering officer of the Society for the district; and Jewish marriages by the secretary of the husband's synagogue. Marriages in a registry office are recorded by the registrar. Marriages at sea must be recorded by the ship-master in the log-book. Marriages of British subjects abroad may be registered by British Consuls. A death must be registered within five days, but, if written notice is sent to the registrar together with a medical certificate, the particulars need not be registered until fourteen days after the death.

REGIUS, *re' jius*, PROFESSOR. Title given to the holders of University chairs which owe their foundation to royal beneficence. Among these are the chairs of divinity, civil law, physics, Hebrew and Greek, instituted by Henry VIII at Cambridge in 1540. Six years later he endowed a duplicate series at Oxford, but with medicine substituted for physics. There are other Regius Professorships established in later times.

REGULUS, *reg' u lus*, MARCUS ATILIUS. A Roman general of the third century B.C. In 267 and again in 256, he was elected Consul, and during his second term was in command of the fleet sent against the Carthaginians in the First Punic War. Completely victorious at sea, he disembarked his troops on the African coast, ravaged the country, taking many prisoners, and began an attack on Carthage, for a time so successfully that the Carthaginians sued for peace. Regulus demanded unconditional surrender, however, and they resumed the conflict, defeating the Romans in 255 B.C. with great slaughter and taking Regulus prisoner.

Beyond this point, the story of his life is largely legendary. According to later chroniclers, he remained in captivity until 250, when he was sent to Rome on parole to make negotiations for peace, promising to

return if the terms offered were not accepted by the Romans. Knowing his probable fate, he urged the Roman Senate to continue the war at all costs, and then returned to Carthage, to meet his death by torture.

REHOBAM. The son and successor of Solomon, King of Israel. By the end of the reign of Solomon the country, especially the northern part of the kingdom, had become wearied by the royal exactions.

A movement was led by Jeroboam, an Ephraimite of the north, who had been an important official under Solomon. At the head of a deputation, he asked for a lightening of the burdens of taxation. Rehoboam returned the insolent answer, "My father chastised you with whips, but I will chastise you with scorpions"—a reply which led to the immediate revolt of ten of the Israelitish tribes under Jeroboam, and the establishment of the Northern kingdom.

During Rehoboam's reign Judah suffered from a disastrous invasion by Shishak (Sesonchus), King of Egypt, whose army occupied Jerusalem and rifled the Temple of its treasures, including the twelve golden shields of Solomon.

REICHSBANK (*riK's*). Central bank of Germany, holding a position analogous to the Bank of England in England. In recent times central banks have become closely associated with the political and economic structures of their respective countries. This has been especially so in Germany, where Dr. Schacht, the President of the Reichsbank, has been taking an active part in the German Government while holding the position of Minister of Economic Affairs and planning Germany's economic rehabilitation. The association of the Reichsbank and the German Government, however, dates back to the formation of the bank in 1875, for even in its early days, the Government had effective control over its policy.

REICHSTADT, *riK' shah't*, DUKE of (1811-1832). Only son of Napoleon I. He received his title, as well as that of King of Rome, from his father.

REID, THOMAS (1710-1796) Eminent Scottish philosopher. He published his *Inquiry into the Human Mind* in 1764 in answer to Hume and was appointed Professor of Moral Philosophy at Glasgow, which office he continued to hold until his death. An essay on *Intellectual Powers* appeared in 1785 followed in 1788 by *The Active Powers*. He held the opinion that belief in an external world is intuitive and instant. By "common sense" he understood not merely vulgar opinion but the beliefs common to rational beings as such; and his beliefs were forcefully reasoned and expressed, so that he was regarded as the leading representative of



REINDEER HERD
Photo. U. S. I.

what many thinkers referred to as "The School of Common Sense."

REIGATE. See **SURREY**.

REIMS (formerly spelt **RHILIMS**), *reims*, or *raNs* (French). A fortified city of Northern France, well-known for its magnificent thirteenth-century cathedral. Reims, the centre of a great vine region, is on the River Vesle, 81 miles north-east of Paris, and is the capital of the department of Marne. Population 112,820 (1933).

Reims is the principal wool market of France and a centre of the dyeing and wool-manufacturing industries. It is also an important producer of wine, and manufactures machinery, chemicals, soap, and paper.

In spite of the great damage which the Cathedral of Reims suffered during the World War, it remains one of the most

beautiful examples of Gothic architecture in the world. It was here that for 650 years nearly all the Kings of France were crowned, and here that Joan of Arc stood at the coronation of Charles VII in 1429.

REINCARNATION. See **TRANSMIGRATION OF THE SOUL**.

REINDEER. Name given to a large deer domesticated in Lapland and other regions. These deer differ from others of the family in having deeply cleft hoofs and a hairy muzzle, in the shape of the antlers, and in the fact that these are borne by both sexes. The antlers are relatively very large, with slender, unequally branching beams, and are used in winter for digging in the snow in search of lichens and moss, the main food of the reindeer. These deer are further distinguished by a thick body, short legs, and broad feet.

The reindeer is the only means of transport used in Lapland. The animals have endurance as well as swiftness, for they can travel with a load of from 250 to 300 lb. at an average speed of 12 to 15 miles per hour. The animals furnish the people with clothing and food, and their skins are used to make tents. In the summer, reindeer meat is cured, and great quantities of cheese are made from the surplus milk and stored for use through the long winter.

The reindeer has been introduced into Alaska by the United States government.

Scientific Name. Reindeer belong to the family *Cervidae*. The specific name is *Kangifer lanandus*.

REINHARDT, rin' hart, MAX (born 1873). Acclaimed by many as one of the greatest personalities in the history of the theatre; born at Baden, near Vienna. He secured employment as an actor, and Otto Brahm, director of the Deutsches Theater, Berlin,

gave the young actor further opportunities in Germany. In Berlin, Reinhardt opened two small theatres, mainly to put into effect his rapidly developing ideas on production. In 1905 he produced *A Midsummer Night's Dream* at the Neues Theater. In the following years he produced many spectacular impressive plays, the best



MAX REINHARDT
Photo Topical

known probably being *The Miracle* in 1911 in London, followed by tours in Germany and America. These activities brought him world-wide recognition. In the Grosses Schauspielhaus, shortly before the War, he produced many magnificent spectacles. Since the War he has continued similar work in Western Europe and America.

REINSURANCE. The system whereby a person who has insured a risk, may himself insure a part or the whole of that risk with another party. It differs from co-insurance in that in the latter case the person insured has a claim against each of the insurers for their individual shares of the risk, while in reinsurance the person insured claims the full amount from the original insurer, who is liable for the full amount. It is not certain when the practice originated but it was known in Marine insurance about two hundred years ago and made illegal in 1746, the ban being raised in 1864. It is during the past thirty years that it has become of real importance. See **INSURANCE**.

REITH, SIR JOHN (born 1889). The Director General of the British Broadcasting Corporation. He was educated at Glasgow Academy, Evesham's School, Norfolk and the Technical College, Glasgow. He then served five years engineering apprenticeship in Glasgow, and proceeded to London as engineer. In the World War he was wounded and later he was in America in charge of munitions contracts for Great Britain; he afterward served at the Admiralty. In 1922 he became General Manager of the British Broadcasting Company Ltd., was Managing Director 1923-6, and from 1927 has been Director-General of the British Broadcasting Corporation. He was made G.B.E. in 1934.



SIR JOHN REITH
Photo Photopress

REJUVENATION. Since the first decade of this century, considerable scientific work has been done in connection with the endocrine group of organs in the body, which elaborate substances to be given to the bloodstream in the form of *internal secretions*. Most of these organs, the thyroid, the suprarenals and the rest, continue to function, if ordinary health be maintained to the end of life—but there is one outstanding exception to this, viz. the gonads: that is, the testis in the male, the ovary in the female; these become less and less active from middle age onward, not only in their sexual, but also in their endocrine functions. Arguing from this fact, some observers have been led to investigate the possibility that the changes in the body which constitute the characteristics of old age may be due, at least in part, to the cessation in activity of the gonads. The pioneer of this work is Voronoff, the Russian physiologist, whose researches in Paris have brought him fame. He has shown, by a long course of experiments on animals, that rejuvenescence of the nervous, muscular and arterial systems of an animal approaching old age can sometimes be brought about by grafting into the body the testicle of a young adult individual of the same or similar species. In the case of man, the difficulty arose that the only animals possessing suitable gonads were the higher apes, preferably chimpanzees, and these are costly and difficult to obtain. When this difficulty has been overcome, it is claimed

that healthy senescent men have had restored to them some degree of their former mental, nervous and muscular vigour for several years. At last, however, the grafted organ itself loses its activity, and senescence again regains its sway.

RELATIVITY, EINSTEIN'S THEORY OF. This hypothesis, the work of Dr. Albert Einstein (see EINSTEIN) has awakened wide interest, among both scientists and laymen. It consists of two parts—a restricted, or special, theory, and a general theory. The first was announced in 1905, and the latter in 1915. It should be said here that Einstein does not attempt to prove, as is often stated, that "everything is relative." He aims to separate the relative from the absolute, and to arrive at a statement of physical laws that shall be independent of the observer. His contention is that many of the laws of classical physics are true only approximately, and are not adequate for the explanation of all natural phenomena under all conditions.

The Restricted Theory. This part of theory is so called because it is restricted to a special kind of motion, namely, uniform motion in a straight line (thus excluding rotary and accelerated motions).

Relativity of Uniform Motion. We shall need an easy approach to the restricted theory by citing an experience familiar to everyone. In a smoothly running railway train, we cannot tell whether we are moving or not, except by referring to objects outside, seen through the window. Houses, trees, and telegraph poles seem to be moving backward while we are standing still, only experience tells us that we are moving forward and leaving these objects behind. A ball thrown from the hand in a train moving fifty miles an hour will fall to the hand again with the same velocity as one thrown in a train standing still, and both will seem to the person who throws them to travel in straight lines. The relative motion of hand and ball is the only motion that counts in the catching. These statements mean simply that uniform rectilinear motion cannot be detected in a moving system without reference to other systems, and such motion in a system has no effect upon the relative motions of objects contained within it.

When we analyse what we mean by the statement that a body is in motion, we find that we always refer that body to something else assumed to be at rest. When we walk from the Pullman to the dining car in a moving train, we say we have moved a certain number of feet, and assume that the train is at rest. Yet the train is moving relative to the earth, and the earth is moving some nineteen miles a second relative to the sun. From astronomical observations, we

have reason to think that the sun itself may be moving several hundred miles a minute, possibly several hundred miles per second, relative to the fixed stars. Are these motions slow or fast? The train's motion is fast compared to our speed when we walk, but compared to the earth's motion in its orbit the train's velocity is very slow. It is apparent, then, that our belief as to whether a body is standing still or moving, or going fast or slow, depends upon the reference frame we select.

Is There Absolute Motion? Long before Einstein's time, scientists had considered the possibility of finding a set of axes to measure absolute motion. They argued that if anywhere in the universe there was something that was absolutely stationary, then this something would serve as a reference frame, and absolute motion could be measured. With the general adoption of the electromagnetic wave theory of light in the nineteenth century, and the agreement of physicists that light and other electromagnetic radiations are transmitted through an all-pervading ether (see LIGHT), scientists came to regard the ether as the long-sought reference frame.

That the ether is stationary seemed proved by the circumstance that every star apparently described a small ellipse annually, a phenomenon called *aberration*. This effect is due to a combination of the velocity of the earth in its orbit and the velocity of light, for light is not instantaneous, but travels more than four years from the nearest so-called fixed star before it reaches us. The classical explanation of aberration assumes that there is no relative motion between different parts or portions of the ether between the earth and the stars. The ether is regarded as a fluid or elastic solid occupying the space between the atoms comprising matter and through which the earth can move with little or no resistance.

In 1887 Michelson and Morley ascertained the velocity of the earth through the ether. They argued that since the ether acts as the medium for the transmission of light, and since the velocity of light is known to a high degree of accuracy, the earth's velocity through the ether might be determined by measuring the apparent velocity of light when light is moving in the same direction as the earth and when it is moving at right angles to or opposite to the earth's motion. With an ingenious apparatus called an interferometer, involving a series of mirrors and a source of light, these experimenters timed the speed of light waves sent back and forth over different paths, expecting to find differences in the time consumed. The results obtained were much smaller than they

had anticipated, from which they drew the conclusion that "the relative motion of the earth and ether is . . . certainly less than one-fourth" of the orbital velocity of the earth. Later computations using the data obtained by Michelson and Morley in their original experiment indicated the existence of a relative motion between the earth and ether of between nine and ten kilometres per second.

Inasmuch as all of these experiments called in question the usually accepted theory of the aberration of light, which requires a stationary ether, the Michelson and Morley experiment was repeated by Morley and Miller, at Cleveland, in 1902-1906; they used a much larger interferometer. The results obtained were in practical agreement with those obtained by Michelson and Morley in 1887. Professor Miller then continued the experiments on Mount Wilson in California from 1921 to 1924, and, as the result of a very elaborate series of observations, announced that there is a positive and systematic effect, as of an ether-drift, corresponding to a relative motion of the earth and ether of six miles a second. This result would invalidate the restricted theory of relativity, the second postulate of which presumes a strictly zero effect from these experiments. The magnitude of the effect, at the same time, is smaller than is required by the old theory of a stagnant ether.

The Restricted Theory in Detail. The negative results assumed for the Michelson-Morley experiments, referred to above, furnish the basis for the restricted theory published by Einstein in 1905. He gives us two fundamental postulates—

(1) When a body is in uniform rectilinear motion relative to a second body, then all phenomena take place on the first in the same manner as on the second; and nothing but relative motion may be detected by any mechanical means whatever between the two systems

(2) Light in free space has a definite and constant velocity (approximately 186,300 miles a second), independent of the velocity of its source and independent of the velocity of the observer.

These two postulates on first reading seem to be mutually contradictory. The first implies that only the relative motion of the source of light and the observer matters, and the second implies that the velocity of light is the same relatively to all observers, whatever their velocity. The first says that we cannot detect absolute straight-ahead motion under any conditions, and the second says that the velocity of light in free space is an invariable motion, a postulate demanded likewise by the stagnant-ether theory. To

use a concrete illustration, if *A* passes *B* at 150 miles an hour, the same light wave will pass them both at the same speed; or if *A* is moving east and *B* west, the same light wave will be 186,300 miles away from both of them at the end of one second (as indicated by their watches). We say that such statements are contrary to what we know about time and space, and that they violate the rules of common sense.

Concepts of Time and Space. Einstein asks us to revise our ideas about time and space. Our sense perceptions tell us that the world is flat, that the sun moves from east to west, and that the direction above our heads is up. We *know* that the earth is round, that the apparent east-to-west motion of the sun is an illusion, and that *up* has no real meaning in connection with space. May we not also be deceived by what our sense perceptions tell us of time and space?

Einstein's description of time and space, and his conclusions concerning measurements, constitute the framework of the special theory. In brief, Einstein says that the time and space with which our earth-bound experience has made us acquainted can be nothing more than the apparent *local* time and space of the moving system, our earth. For time and space change with motion, and concepts of duration, judgments of lengths parallel to the direction of motion, and ideas of simultaneousness are dependent on the motion of the observer. Therefore two observers moving relatively to each other will obtain different results for the same measurements, and both will be right.

In classical physics, time is conceived as something that flows on continuously, unaffected by matter or motions in space; space is independent of time, and provides a setting for the location of objects. The position of points in space is specified in terms of three co-ordinates, namely, up-and-down, forward-and-back, and right-and-left. Space, in other words, has three dimensions, and in measuring solid objects we have to do with length, width, and height.

In the Einstein theory, time and space are not identical, but neither are they independent. Time plays the part of a fourth dimension, and is combined with the other three dimensions to form a continuous medium, or *continuum*, called *space-time*. To fix the true position of a material object in space-time, we must state not only where it is, but where it is at a particular time, adding to the three space co-ordinates the idea of *when*. Our external world is composed of *events*, rather than *points*; each of the positions of a moving object, with the time pertaining to that position, is an event. The world of events is four-dimensional, and

the history of any particle in it will be represented by a continuous line called its *world line*. The same world line represents the history of a moving particle for all observers, but each will choose his own axes of space and time. Time and space having lost their absolute character, it follows that when *A* and *B* are in relative motion—

(1) Objects on *A*'s system appear shorter to *B* in the direction of relative motion than they seem to *A*, and *A* interprets lengths on *B*'s system in the same way. System here means all the objects that are a part of the observer's motion.

(2) Clocks in *A*'s and *B*'s systems run slow relatively to each other; *A* thinks *B*'s clock is running slow, and *vice versa*.

(3) Two events that appear simultaneous to *A* do not seem to occur together to *B*, and conversely.

(4) *A* and *B* form different estimates of the velocities of bodies on the other's system.

The effects enumerated above disappear when the two observers are at rest relatively to each other, and increase in proportion to the increase of velocity relative to that of light. Because we do not detect these effects at ordinary velocities, the older laws of physics are serviceable for all usual purposes. But in special cases, the principle of relativity is claimed by relativists to be superior to the older theories.

Mass and Energy. According to the Einstein theory, mass is not a constant, but increases with velocity, and mass and energy are interchangeable. The increase of mass (inertia) with velocity, as measured by a stationary observer, is demonstrated in experiments with electrons (beta particles) emitted by radium and other radioactive elements. The masses of these swiftly moving particles can be compared and measured when the particles are subjected to electro-magnetic forces, which deflect them from their straight-line direction. The statement that a body acts as if it loses mass when it releases energy, and gains mass when it absorbs energy, is also capable of proof.

The General Theory. In 1915 Einstein extended the principle of relativity to include gravitation and motion of any kind whatsoever. Newton's description of gravitation—a force by which every particle of matter in the universe attracts every other particle—Einstein regards as an artificial definition that does not truly represent the nature of things. He rejects the idea of any body being able to exert an attraction on another body across a space or at a distance, and substitutes the theory that gravitation is a distortion of the world of space-time, due to the presence of matter. Our earth

moves in its elliptical orbit around the sun, not because the sun is pulling on it, but because of an inherent warp, or curvature, in space-time, in the neighbourhood of the sun, by reason of which the planet takes the path it does. Einstein identifies gravitation with inertia, and his law of inertia is that a particle left to itself moves along the shortest lines in the space. This theory gives to space-time a geometry different from that we know as Euclidean, or the ordinary geometry of our schools. Only in parts of the universe remote from matter, says Einstein, is space Euclidean. See GRAVITATION.

The general law for the path taken by any particle in a gravitational field is expressed by the author in terms that are not dependent on the relative motion and position of the observer; that is, the law is valid for all observers under all conditions, and is *general*, not *relative*. When applied to velocities of comparatively slow-moving bodies, it gives results approximately the same as those derived from Newton's formulas, but in cases involving rapid motion it is claimed to be the more accurate.

Tests of the General Theory. The author submitted to three special tests. The first has to do with the orbit of the planet Mercury. All of the planets move about the sun in ellipses, and when any planet is at the end of the ellipse nearest the sun, or at *perihelion*, it moves more rapidly than elsewhere in the orbit. According to Newton, the position of perihelion is fixed, except as the planet is affected by other bodies. The combined attraction of the other planets causes the perihelion of each planet to advance very slowly. In the case of Mercury, which has a very eccentric orbit and a rapid motion in the orbit, the precession of the perihelion cannot be fully accounted for; astronomers have never been able to explain a residue of forty-three seconds of arc per century, after making allowances for all known gravitational effects. Einstein adds to the Newtonian attraction the effect of the mass of the planet, which, according to relativity, increases at perihelion, when the planet is at its greatest velocity. On this basis, the true rate of rotation of the perihelion of Mercury was figured to within one second of arc per century, a result close enough to be claimed as a victory for Einstein's theory. Those who refuse to accept the Einstein theory point to the fact that some astronomers give twenty-nine instead of forty three seconds of arc per century as the rate of advance of the perihelion of Mercury, an amount far too small to agree with Einstein's calculations.

The second test is concerned with the effect of a gravitational field on light. Einstein predicted that the light from a star would be

bent while passing through the strong gravitational field of the sun, and that the amount of bending would be twice that calculated according to Newtonian formulas. Photographs have been taken during several solar eclipses, in order to test out this prediction. The value obtained at Lick Observatory in 1922 was 2.06 sec., while the value predicted by Einstein was 1.75 sec.

The third prediction was that in a strong gravitational field, like that of the sun, light waves would be so lengthened because of the decrease of radiation frequencies that all of the spectrum lines would be shifted toward the red end (see SPECTRUM ANALYSIS). The detection of such a shift is very difficult, but observations on the companion star of Sirius, a very small and exceedingly dense star, seem to give results in agreement with Einstein's prediction.

In Conclusion. Einstein conceives the four-dimensional world of space-time as finite and measurable. In other words, a light wave shot from a star will not go out into measureless space, but will, after a long lapse of time, return to its starting place, for, though it has no boundary, the universe is curved, and "returns upon itself." (The reader should not confuse this curvature of the universe as a whole with the curvature existing in the presence of matter, which accounts for gravitation.) Relativitists say that the inability of the mind to picture the world as drawn by Einstein is not a relevant criticism of the theory as a whole. Reason may take one further than imagination.

In an extension of the theory of relativity published in 1929 Einstein sought to combine the laws of mechanics and electro-magnetism into one general law called "the unitary field theory," a theory which he later abandoned.

Not all scientists have accepted the Einstein hypothesis, but it has received strong support in many parts of the world, and awaits the verdict of the future.

RELIEF. In art, a form of sculpture in which the figures stand out from a surface or background. It is to be distinguished from sculpture in the round, in which the objects are not attached to a background, but stand alone. It forms one of the oldest forms of mural decoration. The famous frieze from the Parthenon, the "Elgin Marbles," is an example of relief sculpture. There are two main forms of this type of sculpture—low relief (*bas-relief*) and high relief (*alto-relievo*). These forms are described under the headings **BAS-RELIEF** and **ALTO-RELIEVO**. *Hollow relief* is applied to sculpture which has the figures carved below the surface. See **INTAGLIO**; **SCULPTURE**.

RELIGION. Religion, as usually defined, is man's acceptance of the existence of

supreme and superhuman powers, attributed to beings or gods who are worshipped by the believer. Systems of religion ordinarily acquire ceremonial rites and practices which are strictly adhered to.

The religions of the world are either *monotheistic* (recognizing one Supreme Being) or *polytheistic* (recognizing several gods). A more detailed classification is that offered by



MARBLE RELIEF OF AN ASSYRIAN DEITY

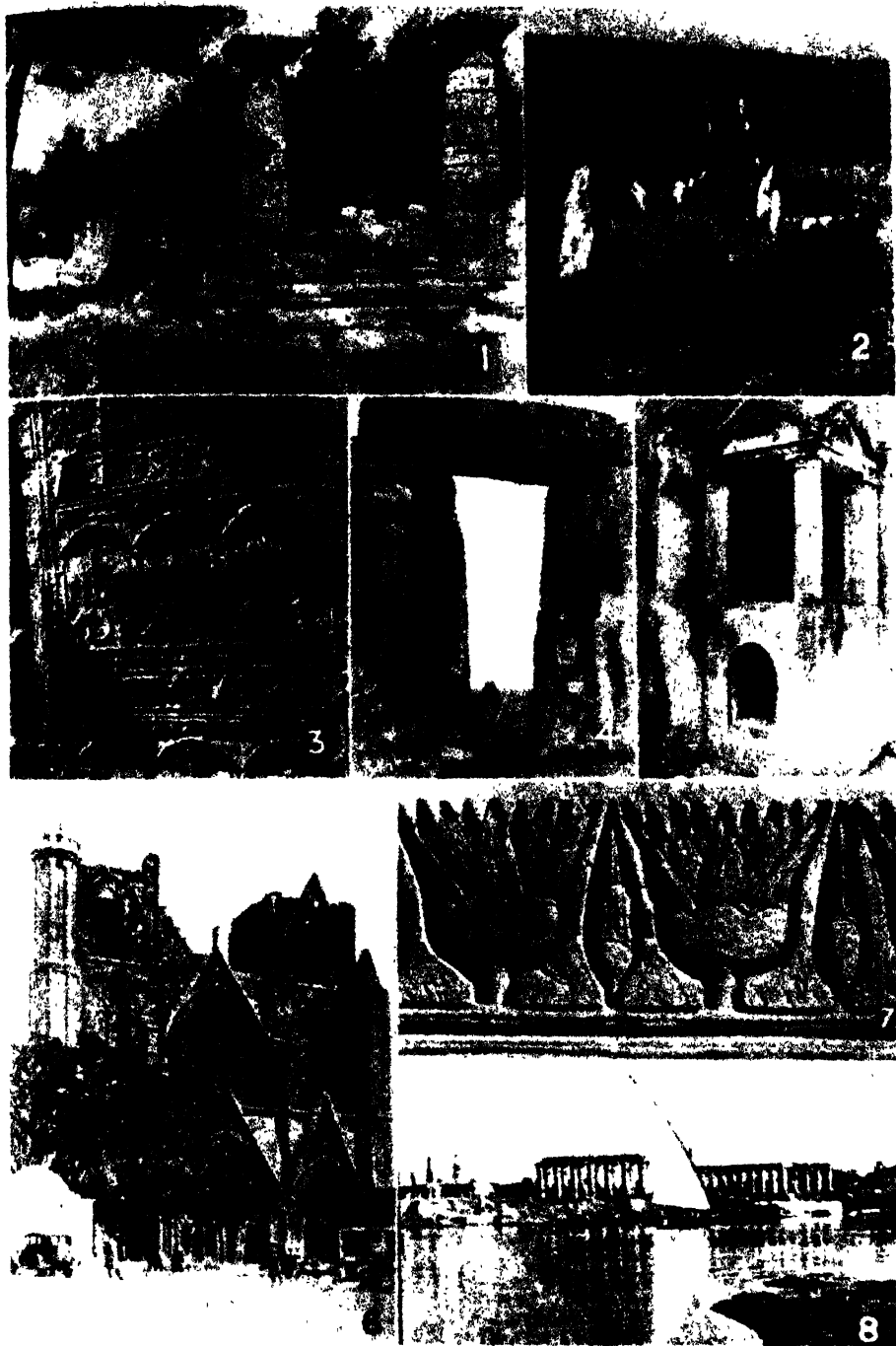
The sculpture shows the eagle-headed, winged deity Ashur (the chief of all the gods), holding the cone and basket (supposed to represent the receptacle in which the divine gifts are stored). The work is covered with standard inscriptions.

Photo: Mansell

Jastrow, who makes the following four divisions—

1. The religions of savages.
2. The religions of primitive culture, such as those of the Indians of Mexico and Peru and those of the Polynesians.
3. The religions of advanced culture, which include those of Egypt, Babylonia, Assyria, China, Greece, and Rome.
4. The religions co-extensive with life, such as Judaism, Christianity, Buddhism, and Mohammedanism.

In connection with such a classification, it is usually assumed by theorists that religion has been the subject of a continuous development, and that the highest



TEMPLES AND SYMBOLS OF ANCIENT RELIGIONS

1. Temple of Hercules, the oldest remaining in Greece. 2. Stone alignment on Shufie Down, Dartmoor, possibly used for prehistoric purposes. 3. Symbols of the Key of Life at the Temple of Deudera, Egypt. 4. The Hele Stone at Stonehenge, a natural way of the late Stone Age. 5. Shrine of Lares and Penates (Roman gods of the household) at Pompeii. 6. St. Nicolas, Larnagusta, now a mosque. 7. Lotus design symbolizing the Life Force (Egyptian). 8. The Temple at Luxor.

(1226)

Photos: George Long

conceptions of a monotheistic religion are, as it were, the end of a chain of progress linking them with the crude ideas of primitive races. On this assumption, it is necessary to find a ruling idea, running through the various manifestations of religious belief from the earliest to the latest, and gradually evolving.

Evolutionary Theory. This ruling idea is the conviction referred to above, that supernatural beings (or a Being) exist, who have control over nature and men. The origin of this idea, practically universal among all races, is variously explained. Some theorists have postulated the cause of it to be a natural intuition implanted in man. Others have found its origin in the emotion of fear, others in ancestor-worship through dreams and the consequent belief in ghosts, others in fetishism or in totemism, out of which latter the idea of tribal deities is supposed to have arisen. The most largely accepted theory in modern times has been that Animism—the endowment by primitive peoples of all sorts of natural objects, such as trees and rocks, with souls—is the origin of the worship of the phenomena of nature, and thus of the idea of powerful spirits behind nature.

All these hypotheses have their difficulties, and a simpler explanation seems to lie in the natural notion of causality. As a writer on this subject in the *Catholic Encyclopedia* says, primitive men "recognize in all the striking phenomena of earth, air and sky the immediate agency of intelligent volition [i.e. without secondary causes]."

The thunder suggests the thunderer. The sun and moon are taken to be living things, or the instruments of an invisible living agency. Personality is associated with them, particularly where the phenomena are suggestive of intelligent purpose."

It is not difficult to see how polytheism grew out of these early conceptions. Moreover, with the advance of civilization and of culture, it was natural that there should grow up sacrificial cults and hierarchies of priests to direct them, and stand between the people and their gods. Of this the ancient and elaborate religions of Egypt and Assyria, of ancient Greece and ancient Rome are examples.

Monotheism. It was given to the genius of the Hebrew nation, even in early times, to recognize behind the phenomena of nature one directing agent—a Personal God who taught man about Himself by a series of divine revelations. On the evolutionary theory, upon which the above remarks have been based, this advance to monotheism would be considered a part of the evolutionary chain. The progress from animism to polytheism, and from polytheism to

monotheism, would be analogous to the advance of mankind in other fields.

But the researches of W. Schmidt, a learned contemporary student of comparative religion, have cast doubt upon this theory. He affirms that among the most primitive races of modern times the worship of one supreme God, through simple cults, prevails. If the inference is accepted that this is a true survival of the ideas of primitive man, who in general fell away from an original purity of belief into the polytheism of the more advanced heathen cultures, the evolutionary theory largely falls to the ground.

Revelation. The orthodox Jew, followed by the Christian, believes in a direct revelation given by God by gradual degrees; and the Christian further believes it to have culminated for all men and for all time in the Incarnation of Christ. Mohammedanism, an offshoot in some respects of Christianity, is also based on a belief in a revelation through the prophet. Of Buddhism, the other great religion co-extensive with life, it is more difficult to speak. Here the "revelation" that came to Gautama seems to be conceived rather as the result of an ecstasy of the purely human spirit in its exalted search for truth.

Relation of Religion to Philosophy and Science. These are disputed questions which may briefly be touched upon. Religious philosophy, strictly so-called, is the sphere of those thinkers who believe in a revelation, with its consequent effects on human thought and life, and seek to give to its truths a philosophic explanation. Their office consists in the application of human reason to the truths believed to be revealed, in order to prove their inherent reasonableness, and to co-ordinate them with other departments of human knowledge. The scholastic philosophers of the Middle Ages with their "proofs" of the existence of God, and Saint Thomas Aquinas in his great work, the *Summa Theologica* are examples. The Anglican Bishop Butler is another, and the same kind of work is being done at the present day by the neo-scholastics of the Roman Catholic faith.

Modern secular philosophy impinges upon religion at various points, and some modern systems, as for instance the Positivism of Comte and the Realism of Marx, both atheistical, offer substitutes for the belief in God and revelation.

Science is concerned with secondary causes, and the idea that there is necessarily any conflict between it and religion is due to a confusion between the religious and the scientific spheres. Science is unable, nor do its best exponents claim, to get beyond these secondary causes to the great first cause

declared by religion to be behind them, and claimed to be God, the Creator and Upholder of the Universe.

RELIGIOUS ORDERS. In the Roman Catholic Church, communities of men or women living under a rule approved by ecclesiastical authority and bound by the three solemn vows of poverty, chastity and obedience. The religious life, understood in the technical sense, means the pursuit of personal perfection by means of the observance of the evangelical counsels, in particular those of poverty ("If thou wilt be perfect, go sell what thou hast, and give to the poor"; Matt. xix. 21) and of chastity (Matt. xix. 12, 1 Cor. vii. 37 *seq.*). The third vow, that of obedience, is complementary to the other two and arises naturally from the community life. Religious orders are *contemplative*, if their members are devoted exclusively to a life of prayer and contemplation; *active*, if their chief purpose is that of ministering to others, mixed, if both characteristics are combined.

The earliest trace of the Christian religious life is found in the "virgins," who during the first centuries were always accorded a special place in the Christian community. It is not until the third century that we first find monks, whose chief characteristic was that they lived in seclusion from the world, though they do not seem at first to have bound themselves by vow, famous among these early monks were Paul the Hermit, Anthony and Pachomius, the first of the Egyptian hermits. Saint Basil the Great (331-379) was the lawgiver of the monks of the East, and it was principally from him that Saint Benedict (480-543) took inspiration in drawing up his famous rule.

Saint Benedict, the Father of Western monasticism, composed his Rule for the monks of his monastery of Monte Cassino, founded in the year 529, and it was for the organization of that single monastery and not for an order as we understand it to-day that he originally intended it. Other monasteries throughout Europe, however, speedily adopted the same rule, and it was natural that these should in course of time become aggregated. The most famous of these groups of Benedictine monasteries was the congregation of Cluny in the late tenth century. A century later Saint Robert of Molesme founded the congregation of Cîteaux, in order to restore the strictly literal observance of Saint Benedict's rule. This order, known as that of the *Cistercians*, has had a long and glorious history. The *Trappists* are a branch of the same congregation.

The monasticism of Saint Benedict finds itself combined with the eremitical life of the early Egyptian monks in the order of the

Camaldolese, founded by Saint Romuald in 1012, and particularly in the *Carthusian* order, founded by Saint Bruno at Chartreuse near Grenoble in 1084.

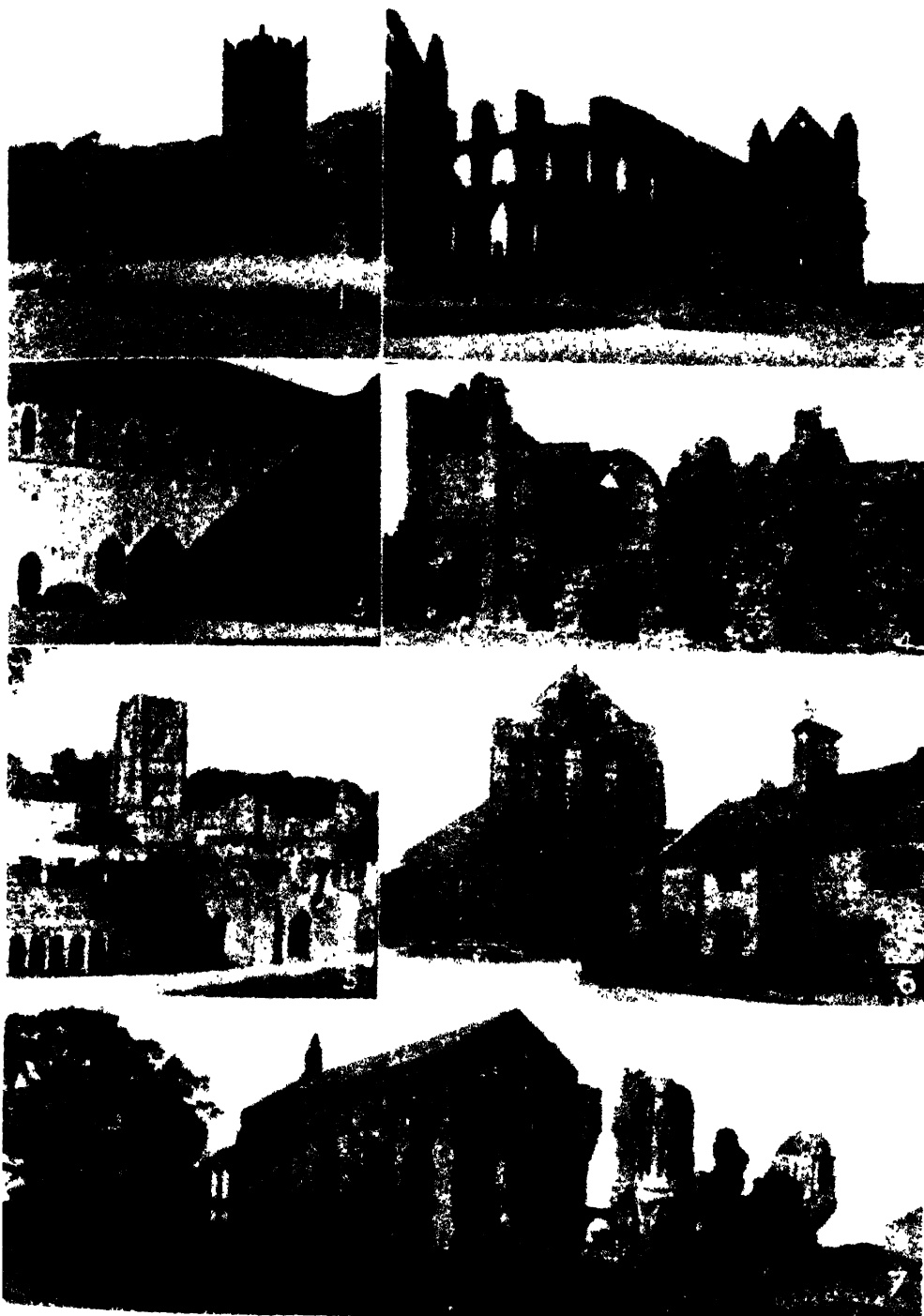
From what has been said of religious orders in general, it is clear that the religious life as such is not necessarily connected with the clerical or priestly state. In the time of Saint Augustine, however, and even earlier we find clerics living in community under a religious rule. These came to be known as *Canons Regular*. The fact that Saint Augustine drew up a rule for such clerics, and that this rule was subsequently widely adopted, has caused the name of *Augustinians* to be given to the *Canons Regular*. Chief among these canons at the present day are the *Canons Regular of the Lateran*, whose foundation dates from the eleventh century, and the *Premonstratensians*, founded by Saint Norbert in 1120.

The widespread laxity of the clergy in the twelfth and thirteenth centuries caused men to devote themselves to giving the world an example of poverty and self-denial. These were Saint Francis and Saint Dominic, the founders of the first *Mendicant Orders*. Their chief mark is poverty. The *Franciscan* order was founded by Saint Francis of Assisi in the year 1209, and the order consists to-day of the following three groups: the *Friars Minor*, the *Friars Minor Conventual*, and the *Capuchins*. The order of the *Dominicans*, or *Friars Preachers*, was founded by Saint Dominic in 1215. Another mendicant order, which appears first in Europe in the second half of the twelfth century, is that of the *Carmelites*, associated especially with the great names of Saint Theresa of Avila (1515-1582) and her friend Saint John of the Cross. The *Servites* (or *Servants of Mary*), founded at Florence by seven noble youths in 1233, are another mendicant order.

Other religious orders have been called into existence for the purpose of carrying out various works of mercy. Thus the *Franciscans* were founded in the thirteenth century in order to succour those who had been taken captive by infidels during the Crusades. And there are many others, too numerous to mention in this article, whose special work is to assist the sick and the infirm.

Perhaps the best known of all the religious orders, the Society of Jesus, more commonly known as the *Jesuits*, is of comparatively recent origin, being founded in 1540 by Saint Ignatius of Loyola. The nature and purpose of this order is fully described in a special article.

Closely akin to religious orders are the so-called religious congregations. These differ technically from religious orders inasmuch as their members are bound by "simple"



EDIFICES CONSTRUCTED BY THE RELIGIOUS ORDERS

1. Mount Grace Priory (Carthusian). 2. Whitby Abbey, Yorkshire (Benedictine). 3. Cleeve Abbey, Somerset (Cistercian). Dormitory windows and the entrance to the Chapter House are shown. 4. Lasby Abbey Guest House (Premonstratensian). 5. Fountains Abbey, Yorkshire (Cistercian). 6. Lancaster Priory (Augustinian). The west front and the house now used by the rector are shown. 7. Binham Abbey, Norfolk (Benedictine).

vows, which are distinct in their juridical effects from "solemn" vows. Among the best known of these congregations are the *Passionists*, founded in 1741 by Saint Paul of the Cross, and the *Redemptorists*, founded by Saint Alphonsus Liguori in 1732. The *Oratorians*, founded by Saint Philip Neri in 1566, are likewise a religious congregation, not a religious order.

The missionary activity of the Church among infidels has also caused the foundation of various religious congregations, notably the Congregation of the Mission (known as the *Lazarists*) by Saint Vincent de Paul in 1625, and in more recent times that of the *White Fathers*, or Missionaries of Our Lady of Africa, by Cardinal Lavignerie in 1868, and Saint Joseph's Society of Missionaries at Mill Hill, London.

REMAND. In criminal law, an accused person is said to be remanded when the hearing of his case is adjourned for a short time pending the collection of further evidence. The defendant may be remanded either *in custody* (i.e. sent back to prison) or *on bail* (see BAIL). As a rule, the duration of the remand is about a week.

REMAND HOMES. See REFORMATORY AND INDUSTRIAL SCHOOLS.

REMBRANDT, *rem' brant* (1606-1669) The representative painter of the Golden Age of Dutch Art. His power of expressing mass and his rendering of detail remain unsurpassed in the history of portraiture. Rembrandt was born at Leyden, and his name in full was REMBRANDT HARMENS VAN RIJN. He began his career as an etcher. About 1631 he removed to Amsterdam, where he spent the rest of his life. There, in 1634, he married the beautiful Saskia van Uylenborch, of whom he painted numerous portraits. The greatest number of his most successful paintings were self-portraits (two of which are in the National Gallery) and likenesses of the members of his family. He died in poverty and obscurity.

"Rembrandts" are to be found in numerous galleries of Europe and America. The artist's first great masterpiece, "The Anatomy Lecture," painted in 1632, is at The Hague; his most celebrated work, the so-called "Night Watch," is in the Royal Museum at Amsterdam, and was painted the year his wife died (1642). In all, there are about 280 canvases and 320 etchings of the master extant, representing the years between 1625 and 1668. The National Gallery, London, has seventeen of his pictures.

Rembrandt was, without doubt, the world's greatest etcher, and a portraitist in oils whose characteristic qualities place him among the greatest of painters.

REMEMBRANCER, KING'S. One of the

most ancient offices in the realm, originally associated with the old Court of Exchequer, which was abolished in 1873. The King's Remembrancer was so called because it was his duty to *remind* the Court of debts due from taxpayers to the Crown, and to set in motion the necessary proceedings for enforcing payment. At the present day the office of King's Remembrancer is held by the Senior Master of the King's Bench Division of the High Court, and all proceedings by the Crown for the recovery of revenue due from defaulting taxpayers go through his department. The King's Remembrancer also has certain ceremonious duties of great antiquity, of which the most important is the Trial of the Pyx. Another is the receiving on behalf of the Crown of certain rents which the City of London has paid annually for centuries in respect of two properties which the City holds of the Crown. One is "The Moors" in Shropshire, for which the City furnishes annually one hatchet and one bill hook. The other is "The Forge" by the Strand; for this the City pays six horse-shoes and sixty-one nails. Another ceremony at which the King's Remembrancer plays a leading part is the annual nomination of Sheriffs for each county.

REMORA. A parasitic fish equipped with a remarkable suction disc on the top of the head, by means of which it attaches itself to the skin of another fish. Sharks are the usual hosts, and it sometimes happens that the remora will penetrate the shark's gills and seek a lodgment in the roof of its mouth; the shark does not appear to object to its passenger. The tenacity with which the remora sticks to its host has been turned to good account by South Sea natives, who tie a line to the tail and turn the remora loose in the water; they gather in the line when the fish has attached itself to a turtle or to another fish, and so secure both host and parasite. The scientific name of the commonest species is *Echeneis naucrates*.

REMUS. Twin brother of Romulus. See ROMULUS.

RENAISSANCE, *re nay' sans*. In the broader sense, the term Renaissance signifies the emergence of the modern order from the medieval; in the narrower sense it denotes the revival of classical scholarship (the "revival of learning") during the fifteenth and sixteenth centuries, beginning in Italy and then spreading into Western and Northern Europe. The intellectual outcome of the study of Greek and Roman antiquity, based on the reading of original texts and on the appreciation of ancient monuments, was known as Humanism. The habit of critical inquiry and free speculation penetrated into every department of life, and a

more liberal spirit was diffused throughout Western Europe, with the result that the institutions and traditions of the Middle Ages gave place to new principles and new values in literature, art, politics, religion, morals, education, philosophy, and so forth. The influence of polite letters (*litterae humaniores*) and of the liberal arts showed itself in the refinement of social intercourse, a receptiveness toward new ideas, a greater tolerance and a keener critical outlook.

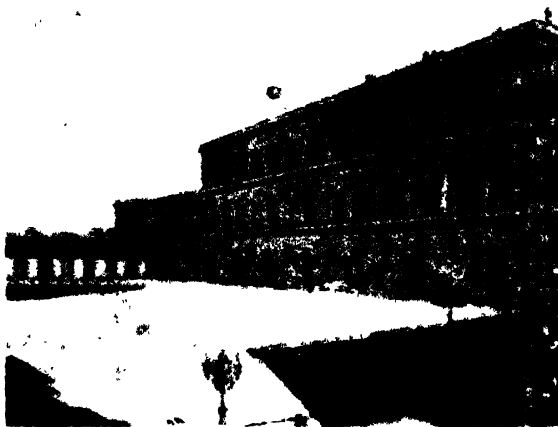
The break-up of the Roman Empire in the fifth century resulted in the loss of the culture of antiquity. The barbarian invaders had neither knowledge of it nor respect for it. Only in the monasteries, in particular the Benedictine, was there preserved any tradition of liberal studies, and these were overlaid by preconceptions which were irrelevant to them, such as the search for mystical and allegorical significance. While some knowledge of the Latin classics was thus handed on, Greek studies disappeared almost entirely. The first important impetus toward humanism was given by Petrarch (1304-74). In his own life and in his teaching he held up the authentic culture of Rome as a worthy model. For him the study of Latin writers was the gateway to sweetness and light. His ideal was one of self-culture.

There was little popular enthusiasm for the prosecution of Greek studies until Manuel Chrysoloras, a Constantinopolitan, was invited by some Florentines to settle in their city and to hold classes in the Greek language (1397-1406). His lectures were so well attended and were so enthusiastically received, that many other teachers followed him from the Universities of the East. Before the fall of Constantinople in 1453, Greek studies were already widely diffused in Italy. There was a ceaseless search for manuscripts, both Latin and Greek, and public and private libraries were established in all important centres, e.g. at the Vatican. Movements were set afoot for the preservation of ancient monuments. Academies and coteries were established to further humane studies (e.g. the Platonic Academy of Cosimo de' Medici at Florence). The invention of the printing press contributed enormously to the spread of the Greek and Latin classes.

In Italy the movement which began with Petrarch may be said to have culminated with Pope Leo X (1513-21). By his time, scholarship had passed over into art and

manners; architecture, sculpture, and painting flourished. It was the age of Michelangelo.

The subsequent history of the Renaissance is to be studied in other countries, for the sack of Rome in 1527 by the forces of the Emperor Charles V scattered the artists and scholars. In the North the typical Renaissance figure was Erasmus, by birth Dutch, but by disposition a cosmopolitan. In Germany the leaders of humanism were Melanchthon and von Hutten; in France, Alexander and Budaeus; in Holland, Lipsius and Grotius; in England, Grocyn, Linacre, Lilly, Colet, and More. The new Humanism,



PITTI PALACE

One of the great Florentine Renaissance Palaces

however, brought with it in Italy certain evils which mar the splendour of the period. The age of the Renaissance was the age of the cynical political philosophy of Machiavelli, of the immorality, worldliness and rapacity of churchmen such as the Borgias and the gross and pagan poetry of Lorenzo de' Medici, Ceretino, and many other writers. In the words of Villari, "prodigious intellectual activity was accompanied by moral decay." Liberty of thought and action from the shackles of the authority of the Church and its traditionally central outlook on life was allowed to degenerate into an excess of licence by men intoxicated with the new ideas. Untrammelled individualism took the place of corporate responsibility: the old morality was for the time overthrown, and the eagerness to enjoy life to the full was indulged to the limit in sensuality and a general loosening of the ties of the moral law throughout the whole realm of conduct. See ERASMUS.

RENAL ARTERIES AND VEINS. See KIDNEYS.

RENFREW. An ancient Burgh and seaport of Renfrewshire, Scotland, with a population of 14,986. It is on the south bank of the River Clyde, about five miles from Glasgow. It is served by the L.M.S.R., and has some docks, with shipbuilding, engineering and other industries. At one time it was the chief Clyde port. Its history goes back to the early twelfth century, when it was a Burgh; it was made a Royal Burgh in 1396.

RENFREWSHIRE. This western county of Scotland has an area of 156,785 acres and a population (1931) of 288,575.

Physical Features. The southern boundary of the county is formed generally by a continuation of the range of hills which separates Lanarkshire from Ayrshire. The highest point reached is the Hill of Stake, 1711 ft. The high ground is a flat tableland, wild, rugged and barren, covered with a thin growth of heather and totally unsuitable for any form of cultivation. This belt of high ground is severed in two places by the Valley of Lochwinnoch and that of Barrhead River, which have become the main arteries of trade between Ayrshire and the industrial towns of Renfrewshire. The landscape is diversified by a number of lochs, one of the largest of which is Castle Semple Lake near Lochwinnoch, nearly 2 miles long and $\frac{1}{2}$ mile broad.

The uplands fall away to the north and west toward the basin of the Clyde, and the remainder of the county falls naturally into two divisions: first, the narrow strip which borders the Clyde in the west of the county, and second, the extensive area of low ground in the north-east, much of which was formerly subject to inundations, but, after reclamation, proved a valuable agricultural district.

The rivers of the shire are small. In the west a few insignificant streams run a short course into the Clyde, whilst most of the remainder is drained by the White Cart, the Black Cart and the Gryfe, together with their tributaries.

History and Antiquities. In the pre-Conquest era, Renfrew formed a part of the Kingdom of Strathclyde. Till an uncertain date it was part of the county of Lanark. As the original seat of the House of Stuart, it is only natural to find Renfrew closely linked with the fortunes of the Royal House. Paisley Abbey also attained great political significance. The importance of this district has survived in the twin titles hereditary to the Prince of Wales—Baron Renfrew, Steward of Scotland.

Sir William Wallace was a Renfrew man. The Wallace Oak near Paisley is reputed to have been the place where Sir William hid when in flight from the English troops.

In more recent history, the momentous Battle of Langside, which dashed the last hopes of Mary Queen of Scots, took place within the county. The riots during the Chartist Movement were particularly severe at Paisley.

Prehistoric monuments are rare. The most important is the Stone of the Druid near Kilbarchan, a Neolithic monolith. One Celtic lake-dwelling has been discovered at Langbank. Roman remains are surprisingly few. Paisley Abbey, founded in the twelfth century, is the best example of medieval ecclesiastical architecture. The most famous of the medieval castles is Barr Castle, dating from the fifteenth century.

Agriculture and Industries. In agriculture Renfrew ranks high among the Scottish counties, for nearly 60 per cent is under cultivation. The great proportion of this, however, is occupied by permanent pasture and the dairy-farming business is, after the manufactures, the most important. The Ayrshire breed of cattle is successfully reared, and a ready market for milk is found in the Glasgow district. The cultivation of wheat has been unsuccessful owing to the cold and moist climate, but until recently nearly 10,000 acres were under oats. Root crops are grown in the north-east.

Renfrew is poor in minerals. Iron ore is present, but its production is relatively uneconomic. Large quantities of sandstone and limestone are quarried. The proximity of the Lanarkshire and Ayrshire coalfield has counterbalanced the lack of a native output, and Renfrew's strides in industrial activity are due to this cause. Shipbuilding on the Clyde is by far the most important industry, and in this respect Renfrewshire shares the primacy with Dumbartonshire. Greenock and Port Glasgow are the chief shipbuilding centres. Paisley shawls are still world famous, but the textile industry was never of such importance as that of thread-making, to-day it is utterly extinct. Thread-making is centred at Paisley and Renfrew. Cotton and silk goods are produced in quantity, and engineering, particularly marine engineering, is of prime importance.

Chief Towns. The county town is Renfrew (which see). Greenock is also described in a separate article.

Paisley is the most populous town in the county (population in 1931, 86,441). It is an ancient Burgh where one of the earliest monasteries was founded, owing to which it became the centre of the social and religious life of a wide area. Its principal activities at the present time are centred upon engineering and thread-making.

Port Glasgow. A Burgh with a population

of 19,580, a town of comparatively recent origin which, in the eighteenth century, attained great commercial importance as the normal stopping-place of deep-sea vessels and the seat of the Customs House.

RENNES, ren. See FRANCE.

RENNIE, JOHN (1761-1821). Engineer and bridge-builder. He was educated at Edinburgh University and directed his studies chiefly to civil engineering. In 1784

he entered the service of James Watt and seven years later commenced business on his own account. He achieved a great reputation as a constructor of docks, harbours and bridges. Waterloo Bridge was designed and its construction directed by him 1810-17, and London Bridge and Southwark Bridge 1815-19. The two last mentioned were designed by him and

built under his personal direction. He also designed and commenced the construction of the Plymouth breakwater. His son John completed the construction of London Bridge, which was opened in 1831, and of the Plymouth breakwater.

RENNIN. See FERMINATION.

RENOIR, ren'wah, IRMIN AUGUSTE (1841-1919). French Impressionist painter. The son of a tailor, he was apprenticed to a porcelain manufacturer, and his experience of painting on china was a valuable aid to the use and understanding of colour. After some years in painting blinds and fans, he entered the studio of Gleyre, from whom he learnt to respect the traditional schools of painting. Later, under the influence of Monet, he acquired the Impressionist technique. After 1880 he produced many portraits and figures of women and children in the momentary, natural pose favoured by the Impressionists, landscapes and rural scenes set down as they appeared in transient light-settings; and some excellent flower compositions. His mature style combines classical form and spirit with the vitality of an original colourist. Well-known pictures include "Rovers' Luncheon," "On a Terrace," "The White Clown," "Portrait of a Young Girl," and "Boulevard in Spring."

RENT. A term which signifies a payment made by one person to another for the use of land or buildings, or other durable prop-

erty. But in the science of economics, the word has quite a different meaning.

Rent in Economics. Assume that a certain number of units of labour and capital (machines, tools, etc.) are applied to land of varying degrees of fertility. The land that is more fertile will yield a larger crop per applied unit than will the less fertile land. The excess of the product obtained on the more fertile land over the product obtained on the marginal land is regarded as *economic rent*. By *marginal land* is meant land which just repays the expenses of cultivation; were the price of the product grown on this land to fall, or the cost of producing it to increase, this land would cease to be cultivated.

Why Rent Exists, and how its Amount is Determined. If land were unlimited in supply and of uniform quality, there would be no rent. There would be no surplus product over and above the product obtained on the marginal land, for there would be no marginal land under cultivation. Accordingly, no one would make any money payment for the use of the superior land. But in prevailing economic conditions, those who own superior land can charge a rental for its use. The rental, roughly stated, equals the probable selling price of the surplus product obtained on the land, over and above the product obtained on marginal land. The selling price of land is arrived at by capitalizing at the current rate of interest, the fixed income which is derived from it.

RENT RESTRICTION ACTS. A series of Acts of Parliament, passed between the years 1920 and 1933, designed to check profiteering by landlords in view of the shortage of houses which occurred in Great Britain in the years after the World War. Certain similar measures were passed during the war itself, but these were repealed in 1920, when the present series of Acts began. The Acts apply only to houses below a certain annual rental; they do not apply to business premises, nor to houses or rooms let furnished. The scheme of the Acts is to stabilize the post-war rent at a fixed ratio to the pre-war rental value of the house, a certain measure of increase over the pre-war rental being allowed. The Acts do not apply to houses built or reconstructed since the war.

Standard Rent. The pre-war rental value of a house is called its *standard rent*. If it was first let after the 3rd August, 1914, then the rent at which it was first let is the standard rent. The rent which the post-war landlord is permitted to charge is the standard rent plus 15 per cent, plus certain other increases in respect of repairs, improvements, increased liability for rates, and so on. The landlord, however, is bound to keep the house in repair.



JOHN RENNIE
(National Portrait Gallery)

Right to Possession. Besides restricting rent, the Acts also limit the landlord's right to give the tenant notice to quit. Without proof of alternative accommodation, he can evict a tenant to whom the Acts apply only in certain specified cases, e.g. if the tenant fails to pay the rent, or if the tenant sub-lets part of the premises at an excessive rent, or if the landlord genuinely requires the premises for the use of himself or his family.

Decontrol. Before the 29th September, 1933, the Acts applied to any "dwelling-house" (i.e. a house or part of a house let separately as a residence) of which either the standard rent or the rateable value did not exceed £105 per annum in London, £90 in Scotland, or £78 elsewhere. Since the 29th September, 1933, dwelling-houses above £45 in London and Scotland and £35 elsewhere have been *decontrolled*, i.e. removed from the operation of the Acts. Houses between £20 and £45 in London, between £20 5s and £45 in Scotland, and between £13 and £35 elsewhere, are not automatically decontrolled by the Act of 1933, but are liable to become decontrolled if they come into the actual possession of their landlords. The poorest class of home is not liable to be decontrolled at all so long as the Acts last. At present the Acts are due to expire on the 24th June, 1938.

RENUNCIATION OF WAR. GENERAL TREATY FOR, also known as the KELLOGG-BRIAND TREATY and the PARIS PEACE PACT. On 6th April, 1927, M. Briand, Foreign Minister of France in M. Poincaré's Government, made a public statement that France would be willing to enter into a treaty with the United States to renounce war as an instrument of national policy. In December of that year, Mr. Kellogg, Secretary of State in the United States Government, suggested that such a treaty should not be limited to the two nations.

This suggestion was accepted, and negotiations between the two officials resulted in the formulation of the treaty, which was signed on behalf of the following fifteen nations: Great Britain, the United States, France, Germany, Belgium, Italy, Japan, Poland, Czechoslovakia, the Irish Free State, Canada, Australia, New Zealand, India and South Africa.

It was signed by the fifteen original signatories at a meeting held in Paris on 27th August, 1928. Later, it was signed by forty-five other nations, and thus became of world-wide effect.

REPARATIONS. GERMAN. See WAR DEBTS; also DAWES PLAN.

REPEAL. When a legislative body revokes or annuls a statute previously passed, it is said to pass an Act of *repeal*. The repeal-

ing Act may state its purpose definitely, or its provisions may be worded in such a way that the revocation of the older Act is implied. In the one case, the legislative body passes an *express repeal*; in the other, a *repeal by implication*; in this latter case, however, if such later Act is repealed, the former one is *not* revived. Only a portion of an Act is sometimes repealed, and in such case, its other provisions remain in force. When a repealing Act is itself repealed, the original Act is not revived unless it is expressly so enacted.

REPLEVIN. Where movable property has been taken away from its owner by way of legal distress (see DISTRESS), the owner is entitled to demand that the person in whose custody it is shall restore it to him, upon his giving an undertaking to bring an action against the distrainor, so as to obtain the decision of the Court as to whether the distress was lawful or not. The owner must also promise that if the decision of the Court is against him, he will surrender the property back again. The recovery of property by these means is called *replevin*.

REPOUSSÉ, *ré pu' say* A form of ornamentation of metalwork, consisting of raised designs and figures made by beating out thin sheets of metal on the back. The art is very ancient, and many examples exist of repoussé work done by the ancient Egyptians and Etruscans. Finely executed Persian and Indian repoussé in brass and silver may be seen also in museums. In Europe the art reached a high level during the Renaissance period, especially in the exquisite work of Benvenuto Cellini.

The metals used are gold, silver, copper, brass, pewter and lead. Usually the design is finished by chasing, silver being the best metal for this purpose.

REPRESENTATION. See ELECTIONS; FRANCHISE; JURY; PARLIAMENT, etc.

REPRESENTATIVES. HOUSE OF. The lower branch of the Congress of the United States, co-ordinate in most of its powers with the upper House, the Senate, and patterned in some degree after the British House of Commons. The number of members was fixed at 435 in 1929, the Constitution provides that the number of Representatives shall not be more than one for every 30,000 people.

REPRESSION. A psychological term which indicates the keeping from consciousness of mental processes that would prove painful. The process of repression is itself unconscious. See MEMORY; PSYCHOANALYSIS.

REPRIEVE. The postponement of the carrying out of a sentence passed on a criminal. It can be granted by the Crown on the advice of the Home Secretary or by the judge in any case where he is of opinion

that justice requires it. In capital cases a reprieve must be granted if the prisoner becomes insane before the time fixed for execution. Sentence of death must not be passed on a pregnant woman. A reprieve is in no sense a pardon (which see).

REPRODUCTION. The term used to describe the making of living things from others of the same kind. As a general rule it requires two types of individuals, two sexes, male and female, and the fusion of special elements which are liberated from them. Reproduction by means of different sexes is practically the only method found in the higher forms of animal life, but there are other methods used by plants and lower animals.

Reproduction in the very simplest forms of life, in the Protozoa (which see), Diatoms (which see), etc., must be considered separately, as these organisms consist only of a single cell, and consequently there is no special germinal tissue and no germ-cells. The whole animal is involved in reproducing its kind. Under favourable conditions the single cell grows to such an extent that there is a loss of equilibrium in its general physiology and a part of it breaks away, or there is an equal division into two parts. The simplest analogy to this is a drop of water forming on a tap. It grows until it can grow no longer and then breaks away.

In single-celled organisms there is another form of reproduction in which a resting stage, called a *cyst*, is formed, and the contents break up by repeated division into many parts. This is called spore-formation.

In all other forms of life, consisting of many cells united together to form a single individual (Metazoa), and in which there is less or more division of labour through tissues having special functions, two forms of reproduction are found: one is called asexual, or asexual, and the other sexual.

Asexual reproduction is commonest among the lowest forms of life, but is rarely found in the higher animals.

The asexual form consists essentially of the breaking away from the parent body of a group of ordinary cells which start off on their own to form a new individual. This is known as budding, and typical examples are found in sponges and sea-squirts. Sometimes the buds remain attached to the parent stock and thus form a colony.

In the sexual form of reproduction two kinds of germinal tissues are necessary. They may be found in the same individuals (hermaphrodite) or in different individuals. The ordinary garden worm is hermaphrodite as it carries both male and female elements. The majority of plants also are hermaphrodite, the flower has an ovary with receptive stigma (female part) and stamens (male

part) which liberate the fertilizing pollen, or male germ-cells. Hermaphrodites are generally capable of self-fertilization, though provision is usually made for cross-fertilization, as in-breeding is not good for the vitality of any stock. Germ-cells are liberated from these sex tissues and fuse either externally, as in the case of most marine organisms and the lower forms of land plants, or internally in the female individual, as in the case of most land animals and the higher plants. Under suitable conditions the fusion of a single cell from each sex (fertilization) leads to a new individual.

In certain animals there is a curious form of degenerate sexual reproduction in which the germ-cells of the female grow into new individuals without fertilization from the males. This method of reproducing is known as *parthenogenesis*, or virgin-birth, and is found typically in aphids, or green-fly. Drone bees also are males produced from unfertilized eggs. See APHIDES, BEES.

REPTILES. A class of vertebrate animal. In the large vertebrate class or sub-phylum of the animal kingdom, reptiles are the first



CROCODILES SHOT IN NORTHERN AUSTRALIA

Photo Australian Trade Engravings

group in which breathing by means of gills has been done away with completely. Thus they are not essentially water animals, though a large number of their present day representatives live in or near it. Being lung breathers distinguishes them from amphibia (which see), which are gill breathers in



ENGLISH REPTILES

Slow-worm (left), Adder (centre), and Grass snake.

Photo: John Kearlton

at least their early stages of development—consider, for example, the tadpole stage of the frog (which see)—and from fishes, which breathe entirely by means of gills. Reptiles are grouped with mammals and birds not only because of the similarity in their method of breathing, but also because all have a skin carrying a protective covering of some description—scales in reptiles, hair in mammals, and feathers in birds—whereas in amphibians the skin is naked. Reptiles



SAND LIZARD

Photo: John Kearlton

also show the beginning of a development in which the limbs support the body completely off the ground.

It is generally believed that reptiles were in existence before mammals and birds, and that these two latter groups originated from some reptilian stock of which the present-day reptiles are the living representatives. Mammals diverged earlier and have lost many characters of affinity which are still evident in birds, the most obvious being the egg-laying habit, though reptiles are not consistent in this respect.

At the present day, reptiles are exceeded in number and diversity of form by mammals and birds, but in past eras, particularly those of the Jurassic and Cretaceous Periods, they were the dominant class. Many of these long-extinct reptiles were of gigantic size—for example, the brontosaurus reached a length of about 60 feet. These ancient forms of reptiles were protected by very heavy structures, consequently they were sluggish in movement, and possessed, relatively, a very small brain.

Reptiles are confined mainly to the tropical and warm-temperate regions of the world. It is essential that they should be, as their body temperature is determined by that of their environment, and they become torpid in cold regions and seasons.

Included in the reptile class of the present day are tortoises and turtles, lizards, serpents or snakes, crocodiles, alligators, etc., and a curious lizard-like reptile of New Zealand, known best by its scientific name, *Sphenodon*.

REPUBLIC. The original meaning of this word, which comes from the Latin *respublica*, was "state" or "commonwealth," and in this sense it is still occasionally used; it is nowadays commonly taken to mean a state the sovereignty of which is conferred by elective, not hereditary, right. There have been many forms of republican constitution. The sovereignty may be vested in one man for life or for a fixed period. An example of the first was the ancient Kingdom of Poland, ruled by an elected King, usually but not necessarily the son of his predecessor; if the Witenagemote ever actually possessed the power of election claimed for it by some nineteenth century historians, Saxon England could then be regarded as republican. Most modern republics follow the second

method, electing a temporary President or Chief Executive. There are infinite variations in the apportionment of executive and legislative power between this Chief Magistrate and whatever parliamentary body or bodies the state may possess; in some republics the President has been little more than the voice of an assembly, and in others he has enjoyed authority denied to many hereditary monarchs.

Some writers have assumed republicanism to have been the earliest form of government, others have ascribed its rise to the decay of monarchy, and no solution of the problem can be attempted here. Among the earliest republics known to us, the city-states of Greece and that of Rome, were certainly preceded by monarchies. These states relied on two or more magistrates not on one President, the Romans only allowing supreme power to a dictator for some specific military purpose. The ghost of the Roman Republic long survived its death, for Augustus and his successors were theoretically only appointed magistrates.

Republicanism reappeared in medieval Europe in the Polish kingdom, in Venice, and in other city-states of Italy, and in Switzerland. In the sixteenth century the United Provinces formed themselves into the Dutch Republic. England's first rejection of the hereditary principle did not long survive Oliver Cromwell, and her second in 1688 was disguised by the polite fiction of abdication and of continued hereditary succession. In the eighteenth century came the federation of the United States and the French Republic; it is noteworthy that Napoleon I, in styling himself Emperor of the French, not of France, claimed to be the heir not the destroyer of the Republic. The nineteenth century saw the Third Republic and the republicanizing of Central and Southern America. In 1911 China became a republic, and since the World War Germany, Russia, Spain, and other countries have done the same. Manchukuo, however, has turned from republicanism to monarchy, and it is possible that some European states may do the same in the near future.

Concerning republicanism two fallacies are widely held. One is that a Republic is necessarily democratic; it is certainly consistent with democracy, pure or representative, but it is equally consistent with oligarchy, plutocracy or tyranny, i.e. absolute but not hereditary rule. The other is that history proves republicanism to be a more efficient system than monarchy. History, prodigal of contradictory examples, cannot be said to prove or disprove such statements.

REQUIEM, *re' kwe em*. See **MASS**.

REQUISITION, *rek wi zish' ün*. The legal term denoting a written demand or request. *Requisitions on title* are a part of the regular procedure in carrying out a contract for the sale of land. They consist of written questions addressed by the purchaser's solicitors to the vendor's solicitors, asking for information on matters affecting the nature and history of the property being sold. The object of them is to enable the purchaser to make sure that the vendor has a good title to the property. Another use of the word is in connection with the administration of companies. The Articles of Association of most companies provide that if the Directors refuse to call a general meeting of the company when asked to do so, some specified proportion of the shareholders, e.g. 10 per cent, can deliver a requisition demanding a meeting, and a meeting must be held.

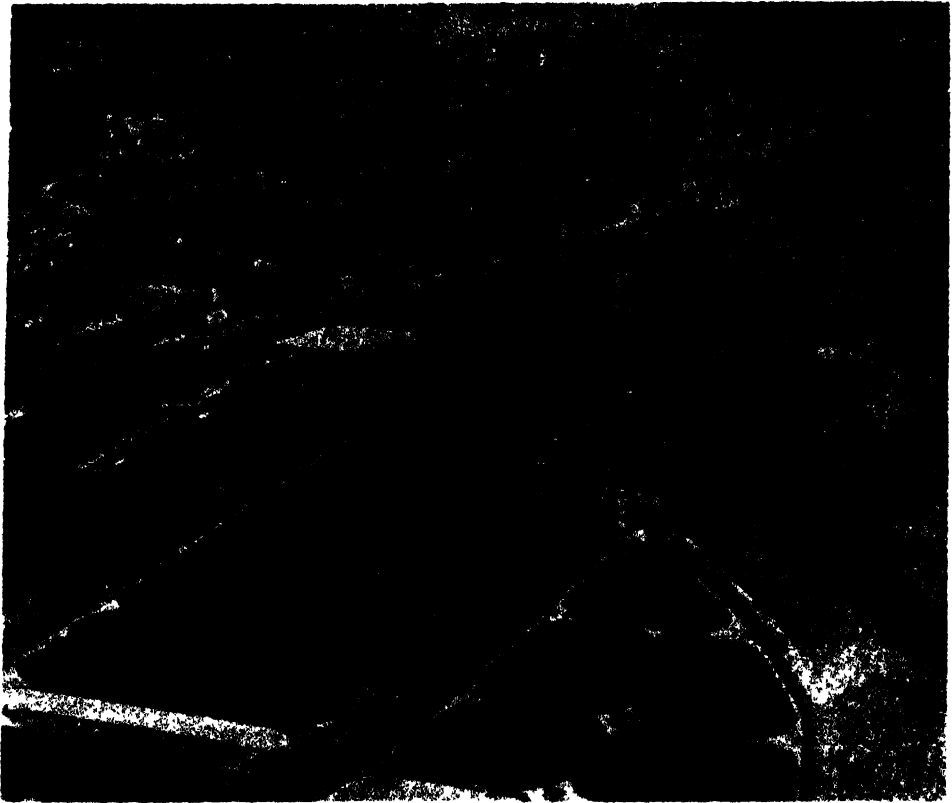
RESCISSION, *re sish' ün*. In law, the term used to denote the dissolution of a contract before it becomes effective, either by some act of the parties or by order of the Court. Contracts of sale, and particularly contracts for the sale of land, often contain a provision that if either of the parties causes delay or raises difficulties as to the completion of the contract, the other party can give notice putting an end to the contract. Even without such a provision, if one of the parties does something which amounts to a repudiation of the contract, the other party can apply to the Court to rescind the contract.

RESERVOIR, *res' er vuah*. In its broadest sense, a large receptacle for storing liquids or gases. In the sense in which the term is ordinarily used, a reservoir is a large receptacle for storing water to be used for drinking and other purposes, in irrigation, or to operate machinery. A lake is a natural reservoir, and some towns obtain their water-supply from lakes.

An artificial reservoir is sometimes made by constructing a dam across a narrow valley or by excavating a basin in a comparatively level tract of land and building up retaining walls.

The sources from which the reservoir is to be filled should be free from animal and vegetable impurities, and the ground which is to form the basin should be cleared of all vegetation and soil containing organic matter. A concrete bottom is an additional protection against contamination of the water. Such reservoirs are frequently filled by pumping water from a neighbouring river or lake.

The largest reservoirs in the world are those formed by dams for storing water for irrigation. See **DAMS**.



ONE OF LONDON'S RESERVOIRS

An aerial view of filter beds at the Metropolitan Water Board's reservoir at Hampton

Photo. Fox

RESINS, *rez'inz* A class of vegetable substances used extensively in the preparation of varnishes, and to some extent in medicine. A familiar method of classification divides them into three classes: (1) those which exude from plants spontaneously or from cuts made in stems and branches; (2) those extracted from the wood by the use of hot alcohol or other solvent, and (3) fossil resins, such as gum copal and amber. A typical resin is a transparent or translucent, non-crystalline solid, yellowish or brownish in colour, and distinguished from true gums by being insoluble in water, but soluble in alcohol, ether, and volatile oils. It melts and burns easily, and can be charged with negative electricity by friction. A common resin of commerce, which exudes from several species of pine, and is a product of turpentine, is generally known as *rosin*. Lac is a resinous exudation of a tree as a result of the puncture of the bark by an insect.

Chemically, pure resins are all compounds of carbon, hydrogen, and oxygen.

RESPIGHI, *res pi'ge*, OTTORINO (1879-1936) A well known Italian composer, born at Bologna. He studied music in Italy under Federico Sarti and Martucci, in Russia under Rimsky-Korsakov, and in Berlin under Bruch. In November, 1923, he was appointed Director of the R. Liceo Musico di Santa Cecilia, Rome. He composed several operas, symphonies and much chamber music, now increasingly popular.

RESPIRATION, *res pi ray' sh'n*. See BREATH AND BREATHING.

RESTAURANT, *res' idr on*. A term applied to esta-



RESPIGHI
Photo. Photopress

lishments open to the public primarily for the service of meals—as distinct from the public house, which is concerned with the selling of intoxicating liquors, and the hotel, the chief purpose of which is the supplying of accommodation. Restaurants include establishments which are licensed to serve intoxicants with food, and those which are unlicensed. The modern restaurant and teasshop is an innovation of comparatively recent date. It was not until the end of the last century that the first A.B.C. restaurant was opened. This proved to be the forerunner of the many thousands of similar houses open to-day. A limited number of establishments for the service of meals have been open in London since the end of the sixteenth century. These are referred to in literature as "Ordinaries," from the fact that they served an ordinary meal, the equivalent of the present-day *table d'hôte*. Later developments were the coffee houses which flourished in London and elsewhere in the eighteenth and nineteenth centuries, and which were often noted for the literary *coterie* which they attracted.

RESTITUTION OF CONJUGAL RIGHTS.

See HUSBAND AND WIFE.

RESTORATION, THE. On 3rd September, 1658, died Oliver Cromwell, Lord Protector of Britain. He had crushed domestic opposition and won foreign respect, but he had failed to construct a working political machine and his power had rested on control of the Army. In any year a free election would have returned a monarchist majority. Many had opposed Charles I rather than the Crown, the commercial classes and many great land owners had been converted to Royalism by the same resentment of taxation that had turned them against Charles, for they suffered under the upkeep of the armed forces and an economically disastrous foreign policy. Richard Cromwell, the new Protector, was deposed in May, 1659, and the nation lay at the mercy of rival warlords until February, 1660, when George Monk, commander of the Cromwellian forces in Scotland, defeated General Lambert, occupied London and made the revived Rump Parliament recall its expelled members and then dissolve. The new Parliament, with a Cavalier majority, voted the restoration of Charles II who entered London on 29th May, kept since as "Oak-apple Day."

RESTRAINT OF TRADE. A principle of law rendering null and void any contract which tends unduly to restrict any person's freedom of earning his livelihood. At one time the Courts refused to enforce any contract which restricted anyone from seeking employment or carrying on business where and when he might choose. To-day,

on being called upon to enforce a restrictive agreement, they apply the twofold test of asking themselves, "Is this restriction reasonable as between the parties to the contract? Is it reasonable from the point of view of the public?" If the answer to either of these questions is "no," then the Court will declare the restriction to be void and unenforceable. There are two kinds of contracts in which it is common to insert restrictive conditions. First, when the owner of a business sells the goodwill, the purchaser will usually insist on the seller undertaking not to set up another similar business in competition with him. The Courts will always enforce a restrictive covenant entered into on the sale of the goodwill of a business, unless it is wider than is reasonably necessary for the protection of the purchaser. The other kind of contract which often contains restrictive conditions is a contract of service. Employers whose businesses entail special skill or secret processes or novel methods are often afraid that their employees will leave them and sell their knowledge to rival employers. They therefore insert in their service agreements conditions restrictive of the employee's liberty of seeking employment elsewhere. Restrictions contained in a contract of service will not be enforced unless the employer can positively show that the restriction is necessary for his protection, and is no wider than is reasonable.

RESURRECTION. The belief in the rising again of the body to be reunited with the soul, it seems to have arisen among the Jews without influence from outside sources, though it can be traced also among the Zoroastrians in Persia.

The ancient Greeks, conceiving of the body with its passions as a clog to pure intellectual activity, rejected bodily resurrection in their speculations on the future life. In this regard it is noticeable that when Saint Paul, in his speech to the Athenians (Acts xvii 22 ff.), mentioned the Resurrection, it is said that "some mocked." The gathering broke up and the apostle went away from the chief Greek city without having made much impression.

Among the Hebrews, the advance toward the belief was slow and hesitating. Indications of it are found in the Old Testament, however, the most explicit being the declaration in Isaiah xxvi. 19. The vision of Ezekiel (c. xxxvii) of the resurrection of the nation in the Valley of Dry Bones presupposes the idea of individual rising.

By the time of the writing of the 7th chapter of II Maccabees, about 150 B.C., the doctrine of bodily resurrection, at least for the righteous, had evidently become familiar, for it is there plainly stated.

In New Testament times, the chief point of dispute between the Pharisees and the Sadducees was the question of the resurrection, believed in by the Pharisees, but denied fiercely by their rivals. The Sadducees attempted to entrap Jesus on the question, and elicited from Him a definite affirmation upon it (see Luke xx. 27-38); and it is evident from the context of this passage and of John v. 19-31, that, in affirming the resurrection, our Lord means the resurrection of the whole man, soul and body.

The rising of Jesus Himself from the dead sets the seal upon the doctrine for the Christian. Saint Paul (Corinthians I, xv.) states its importance.

RETAIL TRADE. The trade that supplies the last link in the chain of production of goods, by which the actual consumer or user obtains his supplies. Sale is usually in small quantities and conducted over a shop counter. The retailer performs a necessary function in that he saves the time that would, without him, be necessary for a small purchaser to seek out a manufacturer or wholesaler who is able to supply his requirements. Another advantage of the existence of the retailer is that he provides a choice of goods of various qualities and prices. This is, of course, more apparent in the case of the large stores and multiple shops. The small retailer still finds a living, but—except in the smaller towns and villages—his number tends to decline in face of the competition of the multiple trader, the co-operative store, the fixed-price store, and similar large concerns. Most retail trade is carried on in shops, and the greater part is cash trade or trade on short credit. A modern development of retail trade is that conducted through the post—the mail-order trade.

The great retail maxim is "small profits, quick returns."

RETAINER. A formal agreement between barrister and client, whereby the barrister undertakes to give his professional services, either for the purposes of a particular action, or generally, whenever his services are needed. The term is also used to designate any similar undertaking between any two persons, e.g. jockey and racehorse owner. The retainer is accompanied by a *retaining fee*, which may also be called a retainer.

RETINA, *ret' in a*. See EYE.

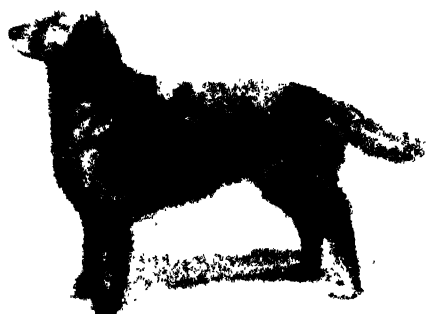
RETRIEVER. The retriever comes into the gun-dog category, and is an excellent worker both in water and on land. As the name implies, his work is to go out with the sportsman and collect for him any game he shoots down.

The **Curly-coated Retriever**, which is now seldom seen, was probably the first breed of dog used in England for retrieving game.

He is a dog of some 70-80 lb., in colour jet-black or liver, the coat water-resisting, being a mass of close, crisp, tight curls.

The **Flat-coated Retriever**, previously known as the wavy-coated. The coat, smooth and fine, with a dense undercoat, must be glossy and soft to the touch, but not silky. Usually all black, a small white star on chest is not objected to, but there must not be any white on legs or head. The tail should be well-feathered, and carried gaily on a level with the back. A dog of moderate size, about 24 inches at the shoulder, he is somewhat of the setter type.

The **Golden Retriever** weighs about 65-68 lb., and stands about 24 in. at the shoulder. He is now very popular and deservedly



GOLDEN RETRIEVER
Photo. Full

so, for in addition to his working ability, he is a wonderful companion, a dog of beauty and clean to the point of fastidiousness. The colour should be a rich gold.

The **Labrador Retriever**—a favourite breed of the late King George V. He is a strongly built, short-coupled, very active dog, wide in the head, through the chest and ribs, and wider and stronger over the loins and hind quarters than the flat-coated retriever. The coat should be close, short, dense and free from feather. The colour generally is a rich



LABRADOR RETRIEVER

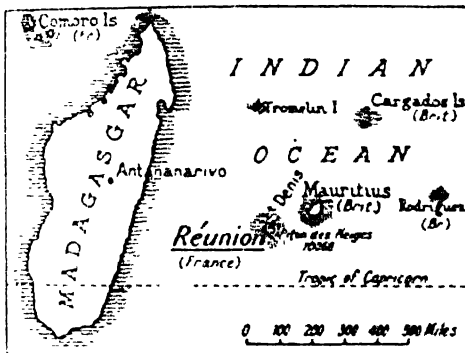
black, free from rustiness and any white markings, except possibly a small spot on the chest. Golden or yellow Labradors are gaining in popularity.

The Curly, Flat-coated and Labradors probably came from the lesser Newfoundland — it is likely that the Flat-coated has setter blood, and the Labrador, pointer. The ancestors of the Golden Retriever were natives of the Caucasus, and were used chiefly as sheep-dogs.

RETTING. See FLAX; HEMP, JUTE.

RETURNED LETTER OFFICE. A department of the General Post Office, to which postage matter which for any reason cannot be delivered is sent from local post offices throughout the country. This matter consists mainly of letters, etc., which are insufficiently addressed, or the addressee of which has left the address named. The mail is here opened and returned to the sender. The former name was "Dead Letter Office."

REUNION, ray u' ni oN. A French island of 970 sq. miles, lying in the Indian Ocean, 420 miles east of Madagascar. It has volcanoes still active, and rises to 10,000 ft.



Piton des Neiges. The climate is warm and, in the summer, wet; there is much frost. The population of 197,933 (1931) is mainly French, with 2000 Chinese and a few Malays and Indians. There are several towns, each of some 20,000 inhabitants, connected by railway. St. Denis is the capital, and Pointe des Galets, near St. Paul, is the chief port. Sugar cane covers a quarter of the total cultivated area, but the industry has suffered lately by the competition of beet sugar. Of old, coffee was the chief crop. Vanilla and manioc are also grown. Administration is by a Governor and an elected council; the island sends a senator and two deputies to Paris. There are many schools and a teacher-training centre. Réunion was discovered by the Portuguese, annexed by France in 1649, and held by the British from 1810 to 1814. The older name was *Bourbon*.

REUNION, CHURCH. The making up of the unhappy divisions of Christendom. Those Churches which claim the name of Catholic, the Church of Rome, the Eastern Orthodox Church and the Anglican Church, are separated from one another by the results of quarrels arising in the past history of the Church, by doctrinal differences, and by political and racial divisions, often the basic causes of such disputes. Rome and Constantinople excommunicated one another at the time of the Great Schism in the eleventh century, and the English Church was cut off from Rome in the sixteenth century; the cleavages remain.

It is increasingly felt on all sides that the evil ought to be amended, but it is more easy to recognize the facts than to arrive at the remedy. Questions of deep principle are involved.

The Church of Rome is unable to admit any basis for Catholic reunion other than a complete submission to the papal claims of infallibility and universal jurisdiction. The Eastern and Anglican Churches consider these claims to be unhistorical and doctrinally inadmissible. The last hopeful attempt to unite the Roman Catholic and Orthodox Churches was made at the Council of Florence, 1439.

As between the Roman and Anglican Churches, efforts towards a *rapprochement* have been made as a result of the Oxford Movement (which see) in the English Church. In 1857 the Association for the Promotion of Christian Unity was formed, and in 1865 Dr. Pusey approached some of the French bishops and was not unfavourably received. But the promulgation of "Papal Infallibility" at the Vatican Council of 1870 put an end to his hopes. Since that time similar attempts were made by Lord Halifax in 1885 acting with the Abbe Portal, and again in the "Malines Conversations" (1921-1925) between certain representatives of the Anglican and Roman Churches under the presidency of Cardinal Mercier. In the former case the Papal Bull *Apostolicae Curae* pronouncing Anglican Orders to be invalid (1893), put an end to the negotiations, and in the latter nothing tangible was achieved.

The situation as between the Eastern Church and the Anglicans is much easier. For a long time the attitude on both sides has been consistently friendly, recorded "as a steady growth" by the Lambeth Conference of 1908. The validity of Anglican Orders has been recognized by several of the Orthodox Churches.

It is impossible in this article to touch on the complicated question of those religious bodies on the Continent, such as the Lutherans and Calvinists who broke away from

Rome at the time of the Reformation, but it is necessary to refer to the non-episcopal bodies in England and the problem of reunion of the Church with them. There are deep cleavages of belief and practice in such matters as the necessity of Episcopal Orders, the bases of Church Government, and the meaning, efficacy and number of the Sacraments. Within recent years the Methodist churches were reunited.

There is increasing friendliness between the Anglican and Free Churches, and a mutual desire to co-operate in all ways, in which no sacrifice of principles at present in dispute is demanded. It is well known that the evils of disunion are most glaring in the Mission field. This has been felt so strongly in South India that a scheme for the fusion of all Christian bodies, with the exception of the Roman Catholics, was recently worked out, and received a considerable measure of approval from many Churchmen and Nonconformists.

REVAL, ray' vah!, officially known as TALLINN. The capital of Estonia (which see).

REVEILLE, revel' e. An army bugle call, sounded at daybreak to awaken soldiers to their duties.

REVELATION, rev el ay' sh'n. See RELIGION.

REVELATION. The name given to the last book of the New Testament, in the English version called *The Revelation of St John the Divine*, and known also as the *Apocalypse* (which see). The oldest manuscript gives the title as *Apocalypse*, or *Apocalypsis Ioannou*. It is supposed to have been written by the Apostle John when he was living on the Isle of Patmos, to which he had been banished. The first part contains a message to the Churches; the second includes a series of visions. Many of the early Church Fathers, including Jerome, questioned its authorship and right to a place in the canon.

REVENUE. See CUSTOMS DUTIES, INLAND REVENUE, TARIFF.

REVERSION. In law, an interest in property which does not give its owner a present right to possession of the property, by reason of some other temporary interest created by the owner. Thus, where the owner of property creates a settlement of it whereby it is to be enjoyed by other persons for a time and is then to revert to himself or his heirs, he is said to retain an interest in *reversion* in the property. See SETTLEMENT.

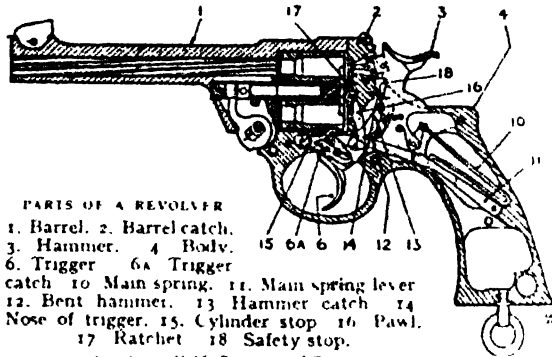
REVERSION. See ATAVISM.

REVOLUTION, rev o lu' shun. This word, which means a turning round or reversal of conditions, is most frequently used in its

political sense of a movement, either military or civil, which has for its object the overthrow of government. It is equally applicable to any great change, such as the purely economic Industrial Revolution.

A political revolution may be external or internal. An external revolution occurs when a part of a nation declares itself independent. An internal revolution occurs when a nation as a whole repudiates its existing political organization and changes its form of government. When revolution destroys an existing organization without plans for a substitute, the action is called *anarchical*; if the aim is a new form of government, it is called *constitutional*.

REVOLVER. A hand firearm. In its simplest form, it consists of a fixed barrel and a revolving cylinder, so made as to bring successively into alignment with the rear of the barrel a series of charges contained



PARTS OF A REVOLVER

1. Barrel. 2. Barrel catch.
3. Hammer. 4. Body.
6. Trigger. 6A. Trigger catch.
10. Main spring. 11. Main spring lever.
12. Bent hammer. 13. Hammer catch.
14. Nose of trigger. 15. Cylinder stop.
16. Pawl. 17. Ratchet. 18. Safety stop.

(Courtesy, H.M. Stationers' Office)

within a variable number of chambers evenly spaced about its axis. The idea of such a weapon is very old, and flintlock, wheel lock and even firelock revolvers were not unknown, but the first person to design a revolver simple and strong enough to function continuously under hard usage was an American, Samuel Colt, in 1835.

About 1900, the automatic pistol, a weapon which has in large measure superseded the revolver, came into common use, and has recently (1934) been adopted by the British Army. In the pistol, the cartridges are ordinarily fed from a detachable magazine inserted into the hollow handle or stock of the arm, the ejection of the empty fired case and the insertion of a fresh cartridge being accomplished through the employment of some of the energy developed by the recoil incident to firing. In a revolver, on the contrary, fresh cartridges are brought into position through the rotation of the cylinder, either as the result of cocking the hammer (or firing mechanism) by hand, or through a rearward pull on the trigger.

Weapons cocked by hand only are said to be of the "single action" type, whereas those cocked by the trigger are known as "double action," or "self-cocking."

REYKJAVIK, *rayk' yah veek*. Capital city of Iceland (which see).

REYNOLDS, SIR JOSHUA (1723-1792). A famous English artist of the eighteenth century. Reynolds was born near Plymouth



SIR JOSHUA REYNOLDS
Photo: Brown Bros

in 1723 and became a pupil of Thomas Hudson, a portrait painter in London. In 1743 he started practising as a painter in Plymouth and then studied both in Rome and in the Netherlands. Later, Reynolds settled down in London, where he soon became a fashionable portraitist, having as his sitters most of the leading figures of the age, including George III. In 1768 he was chosen as president of the

newly formed Royal Academy, and a year later was knighted. In the succeeding years he delivered his famous *Discourses on Art*. His finest work is seen in his portraits of women and children, especially his "Nelly O'Brien" in the Wallace Collection. Many fine paintings in the National Gallery illustrate his skill in design, colour, and draughtsmanship. He is buried in St. Paul's.

RHAETIA, *re' shia*. See RAETIA.

RHAETIC, *re' tic*. **BEDS.** Topmost division of the Trias, consisting of red and green marls, paper shales and white lias. They contain quite few fossils, but those found include the remains of the earliest known mammal. Rhaetic rocks may be traced in a narrow band across England from Dorset by Bristol to Redcar in Yorkshire. In central Europe the Rhaetic is more fully developed than in England, e.g. in the Rhaetic Alps.

RHEA, *re' a*. In classic mythology, a goddess who was the symbol of the productivity of Nature. She was often given the name of "Mother of the Gods." Rhea was the daughter of Uranus and Gaea, or Heaven and Earth; wife of Kronos (Saturn); and mother of Zeus, Poseidon, Hera, Demeter, Hestia and Hades. In Phrygia, a province of Asia Minor, Rhea was identified with Cybele, who presided over mountain fastnesses and fortified places. She was attended by priests called Curetes, and her chariot

was drawn by lions. Rhea cured Dionysus of madness, taught him her religious rites, and then sent him forth to teach the cultivation of the vine.

RHEA, in botany. See BOEHMERIA.

RHEA. A large bird which is popularly called the "South American ostrich." The two groups, however, belong to separate families. The ostrich has two toes, without claws, the rhea three, with claws; and the rhea's head and neck are not so bare of feathers. Though its wings are useless for flight, they are much more developed than those of the ostrich. Finally, this bird is only about half the size of the ostrich, for it stands not more than 3 ft. in height.



RHEA AND CHICK
Photo: Fox

The rhea is not found north of the

equator, but is numerous on the plains of Southern Brazil, Uruguay, Paraguay, and Northern Argentina. It is of some commercial importance; its plumes, much inferior to ostrich plumes, are made into brushes, and its skin is manufactured into a native rug. The local name of the rhea is *nandu*.

Scientific Name. Rheas constitute the genus *Rhea* of the family *Rheidae*. The common species is *R. americana*.

RHEIMS. See REIMS.

RHENIUM. See CHEMISTRY (Table of Elements).

RHEOSTAT, *re' o stat*. A device for regulating and controlling the amount of electric current by interposing various resistances.

RHETORIC. Defined by Aristotle as the faculty of discerning in any given case that mode of utterance which most surely leads to persuasion. It has thus a practical end in view: to convince the reason or to win acceptance for a thesis by calling forth a favourable emotion. Aristotle's *Rhetoric* is an exhaustive treatise on the art in three books, the first of which deals with its general nature and offers a classification of the several species of argument and their respective applications. The second treats of the materials of which the rhetorician may

avail himself, these being conditioned partly by his own disposition and partly by the character of those whom he endeavours to persuade. Some of these, for example, may surrender their minds more readily to a syllogistic type of argument, while others yield themselves up when an appeal is made to their passions and instincts. The third book is concerned with the art of delivery and the arrangement of parts or themes, including a discussion of the various styles of composition.

The study of rhetoric was established in Greece by Corax in the fifth century B.C. and in the following century by Antiphon (himself a notable exponent) and Isocrates. But it was the great authority of Aristotle which caused it to become so important an element in medieval university education. With the coming of the printed book, rhetoric in its primary sense of the art of oral persuasion declined in importance, but the word continued to be used in its secondary signification as the art of literary composition.

It was perhaps inevitable that teachers and exponents of the art of rhetoric should pay considerable attention to the form, as distinct from the substance and motive, of argument, consequently the word gradually acquired a disparaging significance clearly seen in the adjective "rhetorical," suggesting as a rule an artificial and declamatory mode of oratory, designed rather to produce an effect on shallow minds than to convey information to, or to persuade the understanding of, cultured people.

RHEUMATISM, *ru' ma'tiz'm*. A term used to designate a group of disorders of the joints, most of which are inflammatory and the result of infection. There are two great groups of rheumatisms, acute and chronic. Acute inflammatory rheumatism, also called *rheumatic fever* and *acute articular rheumatism*, is an acute inflammation usually of one of the larger joints, due to infection with a coccus. It is characterized by pain, tenderness and swelling of the joint, fever, rapid pulse, a general aching, and profuse sweats. The inflammation has a tendency to jump from one joint to another, and to get better and then relapse. In a large proportion of the cases of acute articular rheumatism, the heart is involved from the beginning of the disease, and much organic heart disease is caused by this form of rheumatism. Sore throat is very apt to accompany rheumatism, being produced by the same coccus, as is also St. Vitus' Dance (which see).

Prevention. It is important to prevent rheumatism, both on account of the illness itself, and because of the danger to the heart from the disease. The teeth, tonsils, and

throat should be kept in good condition. If there is any source of infection elsewhere, it should be cleared up. Exposure to chilling and wetting should be avoided.

Treatment. The afflicted joint should be wrapped well and kept warm. Salicylates are given in large and frequent doses. The action of the heart must be watched.

Muscular Rheumatism. This is a form of rheumatism which affects one or more muscles. If it occurs in the back muscles, it is called *lumbago* (see LUMBAGO); if in the neck muscles, it may be called *wryneck* or *stiff neck*.

Chronic Rheumatism. There are several forms of chronic joint diseases that go by such names as *rheumatoid arthritis*, *arthritis deformans*, and *chronic rheumatism*. It is beyond question that included under the head of chronic rheumatism are several disorders unrelated to it, except that all affect the joints. Some are caused by infected tonsils or teeth, or infection elsewhere in the body. In these disorders the joints are deformed and stiffened, in some of them, the heads of the bones are enlarged. The chronic rheumatisms are generally slowly progressive, they get better and worse, but in the long run, the tendency is toward the worse rather than the better.

Treatment. If a focus of infection can be found, it should be removed or otherwise treated. In some instances, living in a warm dry climate is helpful. Spa treatment is in many cases highly beneficial. Bowel habits should be kept regular. Some benefit may follow dieting. In some cases, hot baths, massage, passive movement exercises, and treatment with heat are helpful.

Historical. Joint affections were one of the first disorders that arose to plague man. The skeletons of man and animals found in early inhabited caves show that the men and the animals of the period were both crippled at times by some forms of rheumatic disorder, as were the Egyptians whose bodies were mummified. The disease was rife in medieval times. Scientific drainage and improvements in working conditions have done much to decrease its incidence.

RHINE, RIVER (RHEIN in German). In the south of Switzerland, close to the St. Gotthard Pass, two glacier-fed mountain torrents start northward. One is the *Forderrhein*, or Hither Rhine, the other the *Hinterrhein*, or Farther Rhine. From the point of union, the river hurries along the Austrian frontier and that of the miniature state of Liechtenstein to Lake Constance (1306 ft.), which frees it of its mountain mud and sends it westward, to tumble over a fall of 70 ft. at Schaffhausen, thence to wind between Baden and Switzerland to Basel.



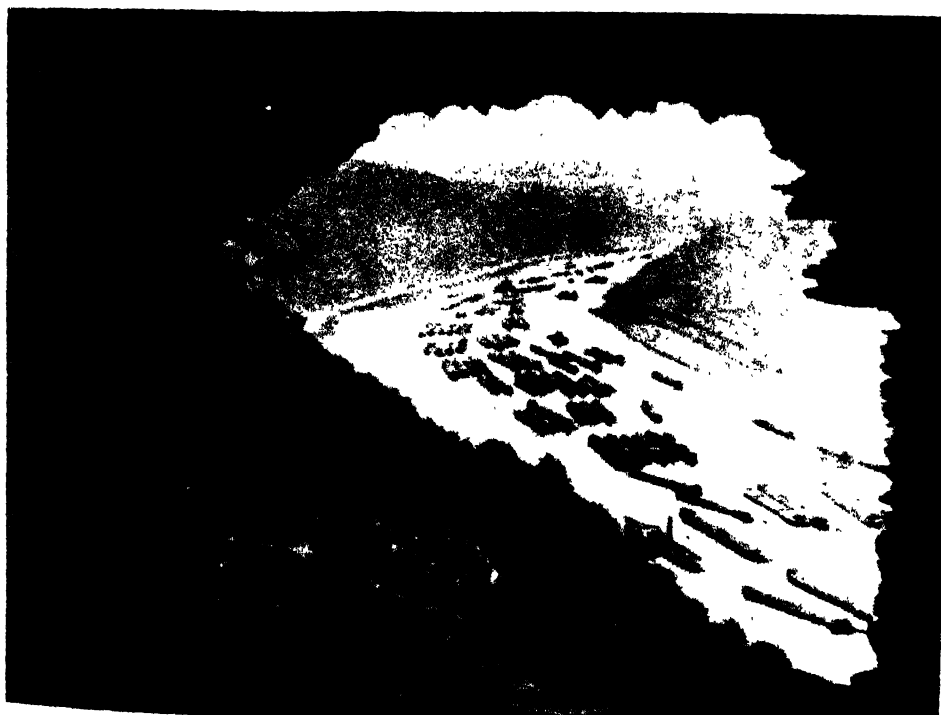
BOPPARD ON THE RHINE

Photo German State Railways

It then turns toward the North Sea, and though it can be navigated at this point, its current is so swift that boats use the Rhône-Rhine Canal as far as Strasbourg. From Basel the river gradually widens until it is half a mile across, but it plunges into a narrow gorge at the town of Bingen. Between Mainz and Bonn is the stretch that is

much visited for its scenery and its castles celebrated in ballad and legend. Here are the Drachenfels, Siegfried's rock, and Lorelei commemorated in Heine's poem, with old-world villages like Bacharach and Boppard. Here also the terraced vineyards produce the light, rich white wines called "locks."

Entering Holland, the river is lost in a



A GLIMPSE OF THE MIDDLE RHINE, WITH A FLOTILLA OF BARGES

Photo German State Railways

delta, the main stream of which flows into the Meuse and makes it possible for ships from Rotterdam to steam up to Düsseldorf, Cologne, Coblenz, Mainz, Frankfurt-on-Main, Mannheim, and Strasbourg.

The Rhine drains an area estimated at over 75,700 sq. miles. Its total length is



INDIAN RHINOCEROS
Photo: Wide World

about 850 miles. It is connected with the Danube by the Ludwig Canal, and two canals unite it with the Rhône, and thus with the Mediterranean. In the north, a canal unites it with the IJssel Meer at Amsterdam.

RHINELAND, OCCUPATION OF THE. The Rhineland Zone comprised the left bank of the Rhine adjoining the French and Belgian frontiers, and a fifty kilometre strip on the right, including Aix-la-Chapelle, Cologne, Frankfurt, Essen, and other important centres. At the conclusion of the World War, French statesmen and generals, including Marshal Foch, pressed that the territory of the right bank of the Rhine, adjacent to the French and Belgian frontiers, should be created into a "buffer" state, under permanent inter-Allied occupation, on the ground that it would minimize the risk of further invasions of France and Belgium. The other Allied Powers could not agree to this proposal, but they were agreed on the necessity for demilitarizing the Rhineland zone. By demilitarization was meant that the area should be free from fortifications of any sort, that it should not be garrisoned by troops, and that it should not possess facilities for mobilization. These stipulations were embodied in articles 42, 43, and 44 of the Versailles Treaty, which Germany was compelled to sign. In 1925, however, Germany freely and voluntarily signed the

Locarno Agreement, which guaranteed the territorial *status quo* of the French and Belgian frontiers, as fixed by the Versailles Treaty, and also the observance of the demilitarized zone. In March, 1936, the Franco-Soviet Pact of Mutual Assistance was ratified by the French Government, whereupon the German Government (in its memorandum of 7th March, 1936) held that the Pact was "directed exclusively against Germany" and that "thereby the Locarno Pact had lost its significance and practically ceased to be." On 7th March German troops reoccupied the Rhineland.

RHINOCEROS, *ri nos' er os.* An ungainly animal, exceeded in bulk only by the elephant and the hippopotamus. An adult rhinoceros weighs from 4000 to 6000 lb. It has an immense solid body, short, clumsy legs, thick, loosely hanging, almost hairless skin, and one or two slightly curving horns projecting from the long nose. The name, from the

Greek, means, literally, "nose-horned."

The animal has three toes on each foot, each toe encased in a separate hoof. On each of the front feet there is a fourth rudimentary toe. The rhinoceros has some kinship with the horse.

The rhinoceros feeds on grass and roots, leafy twigs, and shrubs. The animals are found to-day in a wild state only in Africa



AFRICAN RHINOCEROS
A night photograph taken by flashlight.
Photo: Cherry Kearton

in South-eastern Asia, and on a few large islands near the Asiatic coast.

Kinds of Rhinoceros. There are five distinct species. The rhinoceros most often seen in captivity is the *Indian rhinoceros*, the largest of the Asiatic species. It stands

well over 5 ft. high at the shoulder, and has one great, blue-black horn, very thick at the base and usually about 1 ft. long. Its skin hangs in such definite folds that the huge beast looks as though it were encased in armour plate. Yet the thick hide is sensitive, and can be pierced by a knife or bullet.

There is a similar, but smaller, one-horned rhinoceros which ranges from Bengal into Burma, and southward to Java and Borneo. There is a Sumatran species which is very small and quite hairy, and there is a variety

by the protection of a little bird, about the size of a thrush. This so-called *rhinoceros bird* perches on the animal's head or broad back, devouring the insects.

Scientific Name. The rhinoceros belongs to the family *Rhinocerotidae*. The Indian rhinoceros is known to scientists as *Rhinoceros unicornis*; the Javanese as *R. sondaicus*; the Sumatran as *R. sumatrensis*; the black as *R. (or Dicerus) bicornis*; the white as *R. simus*.

RHIZOME, ri' zome. See BULB

RHODE ISLAND. The smallest state in the American Union. It has a total area of 1248 sq. miles and a population (1930) of 687,497. The state takes its name from an island in Narragansett Bay.

The largest of the thirty-nine cities and towns of the state is Providence, the capital, which had 252,981 inhabitants in 1930. Pawtucket, Woonsocket, Cranston, Newport, and Central Falls are other important towns.

Physical Features and Climate. The state is generally hilly, and has a mean elevation of 200 ft., but nowhere are there mountains.

Narragansett Bay is wholly within the state. It has many arms and estuaries, and contains a number of islands, of which the three largest are Rhode, Conanicut, and Prudence.

The climate of Rhode Island is milder than that of the other New England states, owing to the moderating influence of Narragansett Bay. The mean annual temperature of Providence is 50°, and of Narragansett Pier, 49°.

Resources. The soil, largely composed of boulder clay and stony drift, is generally poor, and there is little agriculture. Poultry-farming and market-gardening are carried on with success, however, owing to the ready markets in the industrial towns.

The mineral wealth of Rhode Island is small. Granite, limestone, graphite, clay, coal and iron ore are found in limited quantities.

Rhode Island began textile manufacture as far back as 1790.

Water power, nearby markets, and the lack of extensive and suitable ground for other industries have caused the rapid development of factories. Woollen and worsted goods are the most important, followed by cotton textiles. The allied trades of dyeing and finishing are also carried on. Silk and silk goods, hosiery, and knitted goods are also important manufactures. Jewellery, foundry and machine-shop products, electrical supplies, silverware, and rubber goods are also produced.

RHODES. A volcanic Mediterranean island, now belonging to Italy. It lies 12 miles off the south-western coast of Asia Minor, and is 49 miles long with a greatest



WHITE RHINOCEROS

The photograph was taken at twelve feet distance.

Photo: Cherry Kearton

of this species which is distinguished by its hairy ears.

The two African species, both two-horned, are known as the *black* and the *white rhinoceros* respectively, yet are almost the same bluish-grey colour. *Long-lipped* and *square-mouthed* are better designations. The black rhinoceros uses its first horn, which is sometimes as much as 3½ ft. long, for attacking and defending itself and for digging. In size and habits, the black rhinoceros much resembles the Indian species, although it is much more savage. Its hide is exceedingly tough, and difficult to pierce. The white rhinoceros, more northerly and now nearly extinct, is even larger than the black.

Rhinoceros Bird. The rhinoceros has no enemies except man and the insects and vermin which infest the tender places concealed by the thickly folded skin. It gets relief by wallowing all day in the mud, and



THE ANCIENT FORTRESS AT RHODES
Photo: Visual Education Service

width of 21 miles; the area is 542 sq. miles. The climate is temperate and the valleys fertile, producing oranges, citrons, other fruits and oil. Sponges are the principal export. The population numbers 56,322 (1933).

In early days, Rhodes was a wealthy and independent state of Greece, famous for its poets, artists and philosophers, the Colossus which stood at the harbour entrance, was one of the Seven Wonders of the World. In 1309 the Knights Hospitallers of St. John made the island their stronghold and held it against repeated attacks till 1522, when they were compelled to abandon it to the Turks.

During the Turkish-Italian War of 1911-1912, Italy occupied Rhodes. By the treaty which followed, Italy agreed to evacuate the island, but no effort was made to carry out the provision. It is now strongly fortified.



CECIL RHODES
Photo: Brown Bros

RHODES, CECIL JOHN (1853-1902) British imperialist and promoter of South African federation; he was born at the vicarage of Bishop's Stortford, in Hertfordshire, and received his elementary education at the grammar school there. For reasons of

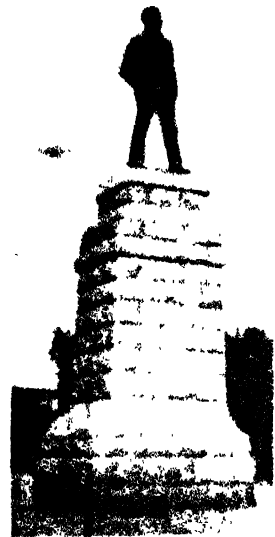
health he was sent, in 1870, to his brother, a planter in Natal. The next year, Cecil

joined in the Kimberley diamond rush, and within two years, amassed a large fortune. From 1876 to 1881 he kept occasional term at Oriel College, Oxford. Meanwhile he succeeded in combining into the De Beers Consolidated Mines most of the companies operating in Kimberley.

In 1881 Rhodes was elected to the Cape assembly, and Bechuanaland was annexed to the British possession, in 1884 through his efforts, notwithstanding the opposition of President Kruger and the Transvaal Boers, whose north-westward expansion was thereby checked.

Four years later, valuable concessions were gained from the Matabeles, who practically surrendered to England the territory known as Rhodesia (which see). For the administration of the latter, the British South Africa Company was incorporated. Rhodes was the dominant influence in the company.

On the discovery of gold on Witwatersrand in the Transvaal in 1886, Rhodes at once



RHODES MEMORIAL AT
BULAWAYO
Photo: Cherry Kearton



RHODES'S GRAVE IN THE MATOPPO HILLS
Photo: High Commissioner for Southern Rhodesia

acquired valuable concessions and soon gained a commanding position in the company known as the Consolidated Goldfields. The gold rush brought so many foreigners (mostly British) into the Transvaal Republic, that a serious conflict of interest arose between the Uitlanders and the Boers.

As Premier of Cape Colony, Rhodes laboured to establish friendly relations between the Dutch Republics and the British colonies, but later, when it seemed that British expansion must be at the expense of the Dutch, he did not hesitate to interfere in the politics of the Transvaal on behalf of the Uitlanders, who were clamouring for civic rights, and thus was in a large measure responsible for the Jameson Raid of 1895. He resigned his premiership as a result of that unfortunate incident, and withdrew to Rhodesia. From 1898 Rhodes attempted to extend the Cape-to-Cairo Railway northward and to promote the African continental telegraph system. When the South African War broke out, he was at Kimberley, where he assisted in the defence of the city. He died before peace was restored; his grave is among the Matoppos Hills in Rhodesia.

As important as any feature of Rhodes's life work was his will, by which he left his fortune to public uses. Most important of his bequests was that to Oxford University for scholarships. See RHODES SCHOLARSHIPS.

RHODESIA. A British possession in South Africa, so named in 1895 after Cecil Rhodes, divided into Northern Rhodesia, with an area of 290,320 sq. miles, and Southern Rhodesia, with an area of 150,344 sq. miles. The whole of Rhodesia is an



BLIND SINGER, PEMBA, NORTHERN RHODESIA
Photo: H. M. East African Dependencies

undulating tableland at an elevation of 3000 to 4000 ft. The gorge of the Zambezi between the two territories, and that of the Limpopo in the south, score deep valleys. The Victoria Falls discovered by Livingstone in 1855, lie on the middle Zambezi; they are about 400 ft. in height. Lake Bangweulu, in



NORTHERN RHODESIA

Above: On the Tanganyika plateau Below: Native porters crossing a stream

Photos: H.M. East African Dependencies, F. H. Meillard

N. Rhodesia, is situated at an altitude of 3700 ft. It has a dry-weather area of about 1700 sq. miles. The tropical heat of Rhodesia is modified by the altitude. Rainfall is chiefly in summer, and not great, decreasing toward the west and south. Parkland and steppe are the natural vegetation, the deep valleys are hot and tend to be unhealthy. The native population consists of Bantu negroes of various races, including Matabele, Mashona and Barotse. N. Rhodesia has a native population of 1,382,705 and 10,583 Europeans. S. Rhodesia has a population of 1,200,200 including 54,000 Europeans. The number of European planters is slowly increasing. Many of the natives live in reserves, of which Barotseland in the west of

N. Rhodesia is the largest. Maize and tobacco are cultivated and cotton is being tried; oranges and wheat are also grown. In many parts irrigation would be an advantage but so far is little developed. Cattle do well in S. Rhodesia and are also found in N. Rhodesia. Mineral wealth is great. Gold brought an unknown people to Zimbabwe many centuries ago, and it is still worked. N. Rhodesia has lead, zinc (produced at the mines at Broken Hill), vanadium and copper; S. Rhodesia has chrome ore and asbestos, while some coal is found near Bulawayo. There are railway connections with South African ports, Benguela and the Belgian Congo.

N. Rhodesia had its capital at Livingstone in the extreme south but a new site has now been chosen at LUSAKA in the centre, which formally became the seat of government in 1935. S. Rhodesia has its capital at SALISBURY (population estimated, 29,000, including 10,200 Europeans), where a new Parliament House is planned. Bulawayo (33,000), chief town of Matabeleland, is a gold-mining centre.

Each of the Rhodesias has its own Governor. S. Rhodesia has an elected legislative assembly, and N. Rhodesia has a legislative council partly nominated and partly elected. Rhodesia grew out of territories of the British South Africa Company which administered it until 1923, when territorial rights were relinquished to the Crown in return for



MANYANI RIVER, SOUTHERN RHODESIA (left) AND NATIVE BEATING MESSAGE ON TOM-TOM

Photos: High Commissioner for Southern Rhodesia



SOUTHERN RHODESIA

Top: Umsleywe River, Mount Silinda district. Centre. Street in Bulawayo. Bottom. Crossing the Sabi.

Photos. High Commissioner for Southern Rhodesia



NORTHERN RHODESIAN NATIVE WOMAN AND
BABIES

Photo: Colonel S. Gore Brown, D.S.O.



BAILA PEOPLE

Photo: H. M. East African Dependencies



TYPICAL NATIVE HUTS IN NORTHERN RHODESIA

Photo: H. M. East African Dependencies

a payment of £3,750,000. The company, however, retained its mineral rights in S. Rhodesia until 1933, when it sold them to the Government for £2,000,000. In 1922



CONICAL TOWER, ZIMBABWE
Photo: High Commissioner for Southern Rhodesia

strenuous efforts were made to induce the Rhodesias to join the Union of South Africa. On a referendum the offer was declined. N. Rhodesia is now a Crown colony and S. Rhodesia a self-governing colony.

RHODES SCHOLARSHIPS. A system of scholarships founded by Cecil John Rhodes (1853-1902), by which students from the British Commonwealth and the United States are entitled to three years' residence and study at the University of Oxford, England.

The scholarships are apportioned annually in the following manner: Canada, 10; Australia, 6; New Zealand, 1; Union of South Africa, 12; Rhodesia, 9; Jamaica, 1; Newfoundland, 1; Bermuda, 1; United States, 32. Every three years one scholarship is allowed to the island of Malta. The value of a Rhodes scholarship is £400 annually.

German scholarships, which were discontinued during the War, were restored in 1930

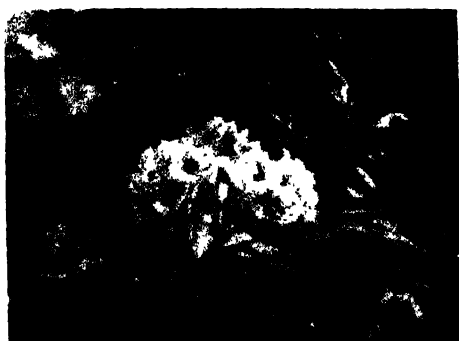
on a two-year basis with an annual value of £300.

Rhodes travelling fellowships, with an allowance of £100 a month for from six to twelve months, enable resident fellows, tutors, or lecturers of either sex at Oxford to undertake research in the British Commonwealth and the United States.

RHODIUM, *ro' dium*. See CHEMISTRY (Table of Elements)

RHODODENDRON. A genus of heathy shrubs which includes the azaleas (which see). The shrubs all have the characteristic lance-shaped glossy leaves, the flowers, which vary from white to a deep purplish red, are borne, often in great profusion, in terminal clusters.

Many varieties are hardy and can be grown anywhere in Britain, provided that the soil is suitable, but some cannot withstand frost and in Britain need the protection of a greenhouse.



RHODODENDRON
Photo: Visual Education Service

The rhododendron will not grow at all, or only with difficulty, if the soil contains lime. Leaf-mould and peat should be dug into the subsoil and packed round the roots if the soil is not naturally suitable. The rhododendron belongs to the family *Ericaceae*.

RHOMBOID, *rom' loyd*. A four-sided figure having only opposite sides and opposite angles equal. See RHOMBUS.

RHOMBUS, *rom' bus*. A quadrilateral having four equal straight sides, but not four equal angles. A rhombus may be converted into a rectangle of the same base and altitude as the rhombus. Hence the area of a rhombus is equal to the area of a rectangle having the same base and altitude as the rhombus. The altitude is the perpendicular distance between the base and the opposite side. The area of a rhombus is also equal to one-half the product of its diagonals.

RHONDDA, DAVID ALFRED THOMAS, 1st Viscount (1856-1918). Famous as Britain's

Food Controller in the World War. He entered his father's business and quickly acquired front rank in the Welsh coal industry, building up the Cambrian Collieries Combine. On four occasions, 1892, 1895, 1900, and 1906, he successfully contested Merthyr Tydfil as a Liberal. For his services



LADY RHONDA
Photo. Central

in 1915 on a special mission to the United States and Canada on behalf of the British Ministry of Munitions he was made a peer. In December, 1916, he was appointed President of the Local Government Board. His great organizing abilities were at once revealed when in 1917 he organized the supply and distribution of the nation's food while head of

the Ministry of Food. His daughter, Margaret Haig, succeeded to the Viscounty under a special remainder. She herself is distinguished as a director of several large businesses, is editor of *Time and Tide*, and author of a biography of her father and other works. See RATIONING.

RHÔNE RIVER. The most important commercial waterway of France. It has its source in Switzerland in the Rhône glacier, from which it issues as a torrent at an altitude of 5909 ft. After flowing through Lake Geneva and south-west to the city of Lyons, the river turns abruptly, and after a southward course of about 250 miles, forms a large delta, and empties into the Golfe du Lion (Gulf of Lyons), an arm of the Mediterranean.

The river is 500 miles long and is navigable for 350 miles; its chief tributaries are the Saône, which meets it at Lyons, the Isère and the Durance. By a series of great canals, navigation from the Rhine, the Seine, the Loire, the Meuse, and Belgian canals is continued to the Rhône, giving connections for river traffic to the Mediterranean.

RHUBARB. A perennial herb with edible leafstalks, the tonic and laxative properties of which are everywhere appreciated. Valuable mineral salts are found in rhubarb, as well as citric and malic acids which, in this form, are beneficial to persons in normal health. It also contains the scurvy-preventing vitamin (see VITAMINS). The juice makes a wine of excellent flavour. The leaves should not be eaten.

The common garden rhubarb came orig-

inally from China or Southern Siberia, but is now cultivated extensively in other cold or temperate countries. The plant is propagated by division or from seed.

The stalks are not ready to pull until two years old, but after that, they may be gathered every spring for several years. They are most tender and juicy when raised by the forcing process. The usual method is to set the roots in spring in deep, rich soil, dig them up in late autumn and force them into growth in a greenhouse or cellar or in a hotbed improvised out-of-doors by covering the roots with a barrel, box, or tall flowerpot, closely banked with manure.

The bitter rhubarb root, used as a cathartic, has been known to the Chinese for over five thousand years, and comes from an Asiatic variety of the plant. It is also an astringent and a tonic. A cheaper and less potent drug is prepared from a similar variety grown in England and some other parts of Europe.

Scientific Name. Rhubarb belongs to the buck-wheat family, *Polygonaceae*. The botanical name of the common garden species is *Rheum officinale*.

RHYME. A word that is variously used in connection with poetry. The spelling *rhyme*, instead of *rime*, came about through confusion with the word *rhythm*. In a wide sense, rhyme is taken to signify poetry in general; or, more specifically, one of the attributes of poetry—the identity of sound in the last syllable or syllables of two or more words. At least one accented syllable must be included to make a true rhyme. *Blank verse* is always unrhymed. See **BLANK VERSE**; **RHYTHM**.

Rhyme is of comparatively late development; the Greeks and Romans did not use it



RHUBARB
Juicy stalks pulled in early summer make a well-flavoured wine

Photo. U. & L.

in their poetry, while in Anglo-Saxon poetry, its place as an ornament was taken by alliteration, the identity of initial consonant sounds. To-day, however, most literatures make use of rhyme; in some, indeed, as in French, it is essential to poetry. In English, the vowel sound of at least the final syllable of rhyming words must be the same, and also the consonant sound which follows, if such there be, but the initial sound should by preference be different. Thus, *true* and *blue* rhyme; *approve* and *remove*; *number* and *slumber*; but *describe* and *ascribe* do not constitute a good rhyme because the *scr* sound is identical at the beginning of the rhyming syllables. It will be noted in the examples of rhyming words given above that in some instances the rhyme is in the last syllable only, while in others it includes two syllables. The former kind is *single*, the latter *double* rhyme. There may be also a *triple* rhyme, as in *identity*, *nonentity*, but it is seldom made use of in serious verse.

Of course, the aim of a poet is to make his rhymes perfect, but often there are found in good poetry such combinations as *love*, *move*, or *none*, *own*. The false rhymes sometimes noted in reading Shakespeare are attributable to changes in pronunciation.

RHYOLITE, *ri'ohlt*. A volcanic rock with a composition similar to granite but of a glassy or crypto-crystalline structure with small crystals of quartz. Flow structure



TARDREE RHYOLITE

The columnar structure can be clearly seen in this example from County Antrim, Ireland

Photo: H. E. Taylor

is often shown, and spherulites may be present. The Tardree rhyolite of County Antrim shows columnar structure.

RHYTHM, *ri'th' m*. A measured or timed movement applied to the dance, to music, and to poetry. Regulated succession of long

and short syllables was the distinguishing feature of Greek and Latin verse. Accent and the recurrence of similar sounds are used in languages derived from the Greek and Latin to emphasize poetic rhythm. The emotions are best expressed in verse by various sounds and movements which employ the time element. Long, open vowel sounds slow up the measure, and these are suitable for expressions of sorrow, sadness, and pensiveness; whereas short vowels lend themselves to joy and gladness, and to the expression of quick movements.

RIBBENTROP, JOACHIM VON (born 1893). Educated in Switzerland, England, and France, he acquired the knowledge of peoples and tongues essential to a diplomatic career. Demobilized in 1920, he became an exporter of German champagnes, frequently visiting France and Britain on business. A close friend of Hitler, he has for long advised him on foreign affairs. He negotiated between him and the Government in 1930 and helped to form the Nazi Government in 1933. As Commissioner for Disarmament in 1934 he visited London, Paris and Rome. In 1935 he was made Ambassador at Large and negotiated the Anglo-German Naval Agreement. In 1936 he visited London to discuss the German reoccupation of the demilitarized Rhine districts and was later made Ambassador to Britain.



VON RIBBENTROP
Photo: Topical

RIBBON. A narrow, woven silk fabric with selvedge edges, of any width up to 9 in. The distinguishing feature of a ribbon is really a technical part of the manufacturing process: on an ordinary loom, only one width of cloth is woven at a time, whereas, on a ribbon loom, at least two widths are woven side by side.

The manufacture of ribbon is a distinct branch of the textile industry. Hand looms on which several narrow "webs" could be woven at one time were in use at Danzig as early as 1600, and at Leyden a few years later. Ribbons are known to have been woven by hand in the eleventh century, near St. Etienne, France, which is to this day a centre of ribbon-making. Basel in Switzerland, Crefeld in Germany, and Coventry in England are manufacturing centres.

RIBBON DEVELOPMENT. See TOWNS PLANNING.

RIBBON-FISH. Sometimes known as Banks's Oar-fish, this strange deep-water creature only comes to light at infrequent intervals. Occasionally specimens are washed ashore along British coasts, and it is sometimes seen by seamen on the surface far out at sea. The body is flattened vertically, carries a long dorsal fin extending from the forehead to the tail, and may be eighteen or twenty feet long. It is of a peculiar leaden colour. This fish may easily have given rise to many of the "sea serpent" stories.

Scientific Name: *Regalicus banksii*.

RIBS. Twenty-four elastic bones enclosing the chest, giving a round framework to the trunk. They are attached to the vertebral column behind; and fourteen of them are attached to the sternum, or breastbone, in front. In man, there are twelve ribs on each side of the body. The seven on each side that are attached by cartilage to the sternum are called *true ribs*, and the other five (on each side) are *false ribs*. The first two upper ribs are placed nearly horizontal, but the others are lower in front than behind. The spaces between the ribs are known as *intercostal spaces*. See **SKELETON**

RIB WORT. See **PLANTAIN**

RICARDO, DAVID (1772-1823) Born in London, the son of a Dutch Jew. He showed considerable independence of mind, and at the age of 19 seceded from the Jewish religion. His father renounced him and threw him upon his own resources, but Ricardo was so shrewd in business that he made a fortune on the Stock Exchange before his 25th birthday. After that, he devoted more of his time to the study of political economy, and in 1809 wrote his first treatise on the subject of currency, entitled *The High Price of Bullion*. This was followed by *Proposals for an Economic and Secure Currency*, in which he advocated a Gold Bullion standard to which the British currency policy from 1925 to 1931 bore much resemblance. He also developed the Quantity Theory of Money and a Theory of International Trade, and drew attention to the dangers of an inconvertible paper currency.

In 1817 he completed his *Principles of Political Economy and Taxation*, a book that for more than half a century profoundly influenced all thinkers and writers in the field of economics. In this book he enumerated the iron law of wages, asserting that the earnings of a labourer tended always to fall to the level of mere subsistence. He formulated also the theory of economic rent. See **RENT**.

Ricardo was a stern individualist, an advocate of *laissez-faire*, and championed freedom of trade.

RICE. Among the many food products derived from the family of grasses rice holds an important place, since it forms the staple food of about one-third of the world's population, being consumed especially in Oriental lands.

The rice plant has been cultivated in India and China from early times, but nothing is known definitely of its original home. From Asia it was introduced into Egypt and North Africa, and finally into Italy, Spain and France. At the end of the seventeenth century it was taken to America.

Climatic and Soil Conditions. The temperature it requires for ripening is between 60° and 80° F.

Lowland rice, which must be grown in standing water during much of its life, may be classified as long grain, short grain, and medium grain, depending on the ratio of length to breadth of the kernel. Originally a marsh grass, rice demands a great deal of water. It likes rich mud to root in, with an impermeable subsoil or *pan* to retain the moisture, and for most of the time the ground is flooded to a depth of many inches.

The fertile deltas of great rivers—the Ganges, Irrawaddy, Yangtze, and Mississippi—are well adapted to the needs of this grain, because they are subject to flooding from the overflow, so are the well-watered plains and river bottoms of India and China, and the low swamps and reclaimed tidelands of the southern United States, Japan, Ceylon, the West Indies, and parts of Central and South America are all good rice-growing districts.

Where there is less natural moisture there must be artificial irrigation.

There is, however, an upland variety that can be grown without water culture, in almost the same way as oats and wheat.

The Rice-Field and its Cultivation. Ridges or embankments of earth divide the rice-field into many smaller fields, separated by canals equipped with dams, sluices, and floodgates, by means of which they can be flooded or drained, according to requirements.

In Oriental countries, the seed is usually sown broadcast in richly fertilized seed beds of half-liquid mud, and the seedlings are transplanted when they are 2 or 3 in. high. They complete their growth in standing water, the ground being kept soft by raking. Full-grown rice is from 2 to 5 ft. in height.

Harvesting and Threshing. When the rice straw begins to turn yellow, the field is drained to put it in shape for harvesting. Reaping machinery is used to cut the grain, although in the Orient the primitive sickle or a small knife usually does the work. After stacking and drying the sheaves, the rice must be threshed, either by machinery



PLUGGING A RICE FIELD IN CHINA



PLANTING RICE

or by primitive methods in most Eastern countries.

The threshed rice is still *paddy*—that is, enclosed in a hull—and this husk must be removed before the rice can be cooked or marketed. In the East the natives remove the husk by pounding the paddy in stone mortars or by other simple means, but for commercial purposes milling machinery is

necessary. The world's largest rice market and milling factory is at Rangoon. Finally the grains are polished before being graded for shipment.

Food Value of Rice. Polishing removes an exceedingly nutritious part of the grain—the fine flour put on the market as rice polish. The natives of rice-growing lands do not eat the pearly-white grains that their



A SIMPLE METHOD OF IRRIGATING A RICE FIELD IN SIAM



JAVANESE RICE CUTTER

The stalks of rice are gathered with the right hand and cut by the knife which is fixed in a bamboo haft and held in the same hand.

Photo Cherry Kearton

foreign customers demand, and the rice they eat is therefore a far more substantial food than our cereal. When they do make the polished grains their chief diet, they are liable to contract the disease known in Japanese as *beri-beri-kakke*.

Rice has not the food value of wheat or maize, however, for it is deficient in fat and protein. It is principally starch.

Other Uses. Apart from the use of rice as a food, *sake*, or rice wine, is made in Japan from the fermented grain, and in Java and India *arrack*, a spiritous liquor, is distilled. Rice starch has many industrial uses; rice bran, polish and straw are used as fodder and fertilizer, and the straw also is plaited to make hats, sandals, etc. Rice paper, so-called, is misnamed, because it comes from an entirely different source—a small tree *Aralia papyrifera*, native to Formosa.

World Production. The countries of Asia grow more than 90 per cent of the world's rice crop, which is estimated at 100 billion pounds yearly. In the British Empire, India is the largest producer, about 78,000,000 acres being under cultivation, chiefly in Bengal and Burma. So large is the annual crop that India exports as much as 40 per cent of the world's supply. China and Japan produce large quantities which, however, have to be supplemented by imports to meet the home demands. Java, Siam and French Indo-China have a large export trade and the United States with about 900,000



TYPICAL RICE-FIELDS

acres under cultivation, also ships rice in increasing quantities.

Scientific Names. Rice belongs to the grass family, *Gramineae*. Its botanical name is *Oryza sativa*. Although wild rice belongs to the family *Gramineae* also, it is a distinct form, with the botanical name of *Zizania aquatica*.

RICHARD I (1157-1199). King of England. Third son of Henry II and Queen Eleanor, he ascended the throne in 1189 at the age of 31. He had already succeeded, as Duke of Aquitaine, to his share of the Plantagenet inheritance in France.

Gascony was one of the centres of the troubadours, to whom the beautiful Eleanor was both patron and inspiration, and two of the strongest passions of Coeur-de-Lion's life were for fighting and for music. Various campaigns against his father and his elder brother, Henry, had proved him a great captain as well as a great warrior.

Richard's reign falls into two almost equal portions: the first five years (1189-1194) were occupied with the Third Crusade and the adventures which befell him on his return journey; the second five years (1194-1199) were taken up with campaigning in France. During the whole of his reign Richard spent only some six months in England.

The Third Crusade. Saladin, champion of the Saracen Turks, welded the Moslem States into unity and led them to the conquest of Jerusalem in 1187. In the following year the Archbishop of Tyre called on the princes of Europe to recapture the Holy City for Christendom. Henry II was one of the first to take the Cross, but he died before he could set out, and the duty devolved upon his successor. Richard, who had a taste for knight-errantry, took up the obligation with enthusiasm, in conjunction with Philip Augustus, King of France, and Leopold of Austria. He left as Regent the unpopular Chancellor Longchamp, whom the barons despised as an upstart. Moreover, he imprudently endowed his traitorous brother John with some rich earldoms.

Richard raised money for the expenses of his crusading army by many questionable means. He allowed the high offices of the chancellor, the justiciar, and the sheriffs to be sold; he taxed the Jews heavily, and for a consideration gave back the freedom of Scotland to William the Lion. He set forth from France in 1190 with about forty English ships and made for Sicily. Here, after many adventures, Richard was betrothed to Berengaria of Navarre, whom he married in Cyprus after the conquest of the island. It took the Crusaders eighteen months to reach Acre, which surrendered to them after a siege of a few weeks' duration. Jealousy

and dissension, always latent, now broke out openly among the three leaders. The French and Austrian troops were withdrawn, leaving Richard to advance to Jerusalem with a force which, unsupported, was too weak to undertake the siege. He therefore made a truce with Saladin, securing the right of Christian pilgrims to visit the Holy Sepulchre without molestation.

The Crusades show "Richard Yea-and-Nay" at his best and at his worst. The fighting-men of all nations looked to him without hesitation as the true leader, knowing that his presence was likely to bring success. His courage and his skilled strength won him some amazing but well authenticated personal triumphs. All his achievements, however, were marred by childish and passionate quarrels with his fellow princes, until jealousies wrecked the entire Crusade. His relations with Saladin, and his friendship with the Sultan's brother Saphadin, were genuinely chivalrous. Yet at Acre, Richard had ordered the massacre in cold blood of nearly three thousand Moslem prisoners. "El-Melek Ric" is still a traditional name of terror in the Near East.

On his return journey Richard was shipwrecked in the Adriatic and, though disguised, he was captured at Vienna by Leopold, who handed him prisoner to the Emperor Henry VI. He was kept in an Austrian fortress for thirteen months. The story of his discovery by the wandering minstrel Blondel is legendary. He was ransomed on payment of 150,000 marks, raised by a levy in England, and arrived home in March, 1194.

"Look to yourself, the great Devil is unchained," wrote Philip Augustus to John, who had deposed Longchamp and raised an insurrection, only to be defeated by the Justiciar. Richard gave his brother free pardon.

French Wars. Two months later, having raised a further sum of money, Richard left for France to defend his patrimony. He succeeded in preserving the Angevin inheritance and in restraining for a time the ambitions of Philip, who was endeavouring to unite the province of France into a strong monarchy. To defend Normandy and its capital Rouen, he built Château Gaillard at a bend in the River Seine, perhaps the most magnificent fortress of the Middle Ages. Richard met his death from an arrow shot from the walls of Chaluz, which he was besieging in the hope of laying hands upon treasure-trove which his vassal refused to surrender.

The Constitutional Importance of this reign is considerable. First, innovations were certainly made under the rule of Hubert

Walter, Archbishop of Canterbury, an official trained under Henry II: he was Justiciar from 1194 to 1198, when he was replaced by Geoffrey FitzPeter. In the Itier or Judicial Visitation of 1194, members of the grand jury are to be elected (*eligendi*), not appointed by the sheriff, and representatives of the shire courts are to assist in the assessment of taxation. Richard was certainly not aiming at an elected representative assembly, but was solely concerned with the efficient collection of money. It is thought that the institution of coroners can be traced to this Itier, which also laid down that royal pleas were to be heard by justices in eyre, not by sheriffs. An edict of 1195, for the electing of knights to receive oaths for maintenance of peace, may be the germ of Justices of the Peace. It would be rash to say that new principles were adopted, but the general effect must have been to check the sheriffs and to raise the importance of the knights of the shire or small gentry, the class which was later to form the strength of the House of Commons. More definite were the liberties that Richard sold to many towns. In 1191 John, in his absence, had granted to London a Mayor and a "commune," the exact meaning of which has been hotly debated. In 1198 Hugh, Bishop of Lincoln, refused to supply mounted knights for service in France, an act which has frequently been described as "successful constitutional resistance to illegal taxation"; it may later have formed a useful precedent, for it was certainly successful, but the resistance seems to have been far more "unconstitutional" than the demand. The real constitutional importance of the reign lies in its testing of the work of Henry II, for the King's law was still respected in the continued absence of the King. So great a respect for law had grown up that the illegal deposition of Longchamp was done in form of a legal trial. Later insurgents sought, not to defy the law, as in the reign of Stephen, but to control and interpret the law for their own interests.

Character. It is because Richard's interests lay elsewhere that this decade of English history is of such significance. England was Richard's purse, into which he dug deep to pay for his expensive and quixotic adventures abroad. He is remembered as a figure of poetry and romance, an embodiment of national honour and military prowess reflected in the title *Coeur de Lion*. He was as well a callous, greedy, fire-eating soldier of fortune, without a vestige of statesmanship. He represents, in fact, the paradox of medieval chivalry, in which piety, heroism and the defence of the weak were often found allied with brutality.

RICHARD II (1367-1399) King of England. He was son of the Black Prince, and succeeded his grandfather, Edward III, in 1377 at the age of 10.

Minority of Richard: the Peasants' Revolt. The conflict between landlord and villeins, which was a legacy of the Black Death, came to a head in 1381. The plague in 1349-50 had carried away about a third of the whole population. A serious shortage

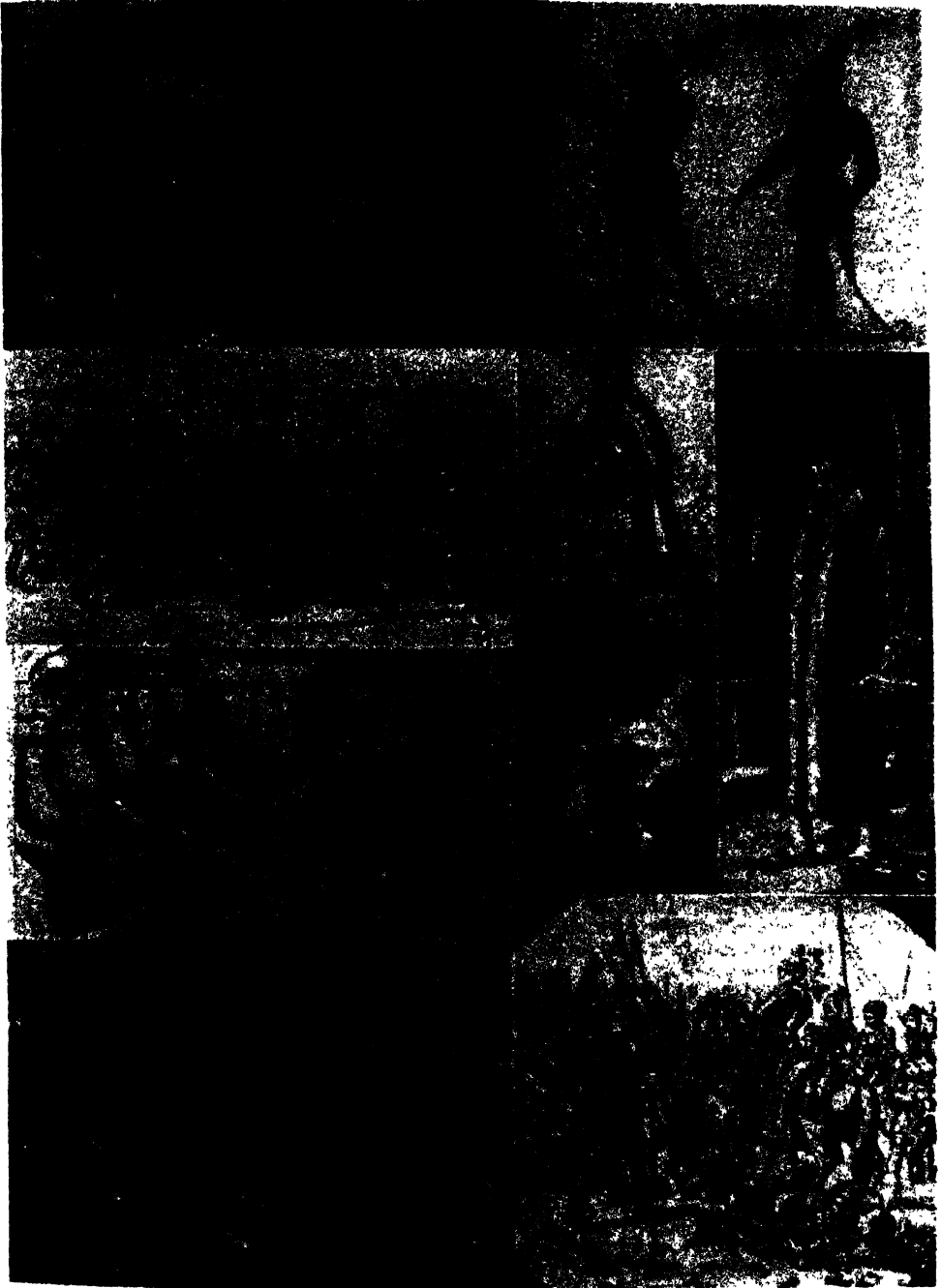


RICHARD II
(Natio. at Portrait Gallery)

of labour resulted, and laws were passed to limit wages, to control prices, to check the migration and emancipation of the villeins. Discontent was fanned into flame by the hated Poll Tax. John Ball was the preacher, Wat Tyler the leader of the movement, which was aimed at the landlords, the lawyers and the wealthy clergy. Their slogan was the couplet —

"When Adam delved and Eve span,
Who was then the gentleman?"

The rebels, who were particularly strong in East Anglia and the Home Counties, marched on London. Richard, then a youth of 14, courageously rode out to confer with them at Mile End, and won them over by promises of reform and emancipation, yet not before



SCENES FROM THE REIGNS OF THE RICHARDS

1. Richard I fighting in Palestine. 2. Chain armour worn by the men-at-arms fighting under Richard I.
3. Battle scene: the armour is of the time of Richard II. 4. Parliament deposing Richard II. 5. The arrest of the Duke of Gloucester. One of the five Lords Appellant, Gloucester at first openly bullied Richard II but the king won over sufficient of the great lords to enable him to suppress Gloucester.
6. A Knight Templar. Founded in 1119, this military and religious body played an extremely important part in the Crusades such as that undertaken by Richard I. 7. Wat Tyler, subsequently the leader of the rebellion that bears his name, slaying the collector of Poll Tax in 1381. 8. John Wycliffe the celebrated preacher and reformer of the reign of Richard II. 9. After the Battle of Bosworth Field.

Photos. N.

the Archbishop of Canterbury, Simon of Sudbury, had been murdered. A further conference took place at Smithfield, when Wat Tyler was struck down by the Mayor of London. A cruel reaction followed; promises were broken, pardons were revoked, but nothing could check the emancipation of the villeins, for which the times were ripe.

Intrigues among the King's Uncles. The real power was now in the hands of John of Gaunt, Duke of Lancaster, the King's eldest uncle, though a Council of Twelve had been nominally entrusted with the government. In 1385 Lancaster went over to Castile to urge his claim to the throne, and Richard, against the wishes of Parliament and the rest of the nobility, leaned on Michael de la Pole, whom he made Chancellor and raised to the Earldom of Suffolk, and on Robert de Vere, Earl of Oxford, whom he created Duke of Ireland. Suffolk was honest and capable, but Oxford was a brilliant, unstable aesthetic, and his winning of a rank hitherto reserved for princes caused much indignation. The short-sighted policy of Edward III had made great landowners of the cadets of the Royal House. These princely barons were led by Gaunt's youngest brother, Thomas of Woodstock, Duke of Gloucester, who was supported by the irremediable Edmund of Langley, Duke of York; by Gaunt's popular son Henry Bolingbroke, Earl of Derby; and by two powerful brothers, Richard, Earl of Arundel, and Thomas, Bishop of Ely.

In 1386 the grandees attacked the ministers and had themselves appointed to a Commission of Reform, although the judges declared, in the *Opinions of Nottingham*, that these acts were illegal, Parliament being restricted to affairs submitted to it by the King, who alone could dismiss ministers. Oxford's troops were scattered at Radcot Bridge, and in 1388 a packed assembly, the Wonder-Working or Merciless Parliament, sentenced the King's friends to exile or to death, on the appeal of five *Lords Appellant*—Gloucester, Arundel, Bolingbroke, the Earl of Warwick and Thomas Mowbray, Earl of Nottingham. Gloucester openly bullied the King and misruled the country, but by 1390 he had been subdued. Richard had won over the returned Gaunt, York, Bolingbroke and Mowbray; he had also some genuinely devoted followers, the Earls of Kent and Huntingdon, his half-brothers, and the Earl of Salisbury, as well as a body-guard of archers he was collecting from the loyal county of Cheshire.

Richard ruled with wisdom and moderation having apparently forgiven his enemies. Anne of Bohemia, his beautiful and charming wife, died of fever at Sheen in 1394; his

bitter grief is said to have warped his nature. His marriage in 1396 to Isabella, the seven-year-old daughter of Charles VI, sealed the peace he had made with France. Roger Mortimer, Earl of March, grandson of his eldest uncle, Lionel of Clarence, had been proclaimed heir presumptive; he had proved his worth in Ireland, a country which Richard visited and brought under better control. Another loyal friend was young Thomas Holland, who succeeded his father as Earl of Kent.

Richard's Despotism. In 1397, on a charge of conspiracy, Arundel was beheaded and his brother, now Archbishop of Canterbury, and Warwick were banished. Gloucester was hurried in Mowbray's charge to Calais, whence his death was reported. Kent, Huntingdon, Bolingbroke, Mowbray and York's son, Edward, Earl of Rutland, became respectively Dukes of Surrey, Exeter, Hereford, Norfolk, and Aumerle. In 1398 Parliament, packed this time by royalists, upheld the *Opinions of Nottingham*, voted ample supplies and delegated its powers to a committee of thirty. Bolingbroke and Mowbray, the surviving Appellants, brought counter-charges of treason, and Richard banished both. He was now absolute, but he received a serious blow when Mortimer was killed in Ireland.

While Bolingbroke was absent, John of Gaunt died, and Richard appropriated the Lancastrian inheritance, which he said was confiscate. Little suspecting any danger, Richard then sailed for Ireland to suppress an insurrection. Bolingbroke seized his opportunity and returned to claim his estates and honours. Landing at Ravenspur, he was at once joined by several disaffected earls; the Regent, York, did nothing and the leaderless royalists submitted. Richard's return was delayed so long that any hope of effective resistance to the growing demands of Hereford vanished. The King was kidnapped by the Earl of Northumberland and conveyed to the Tower of London. There he was forced to sign an act of abdication, which Parliament accepted.

Bolingbroke, now crowned as Henry IV, sent him to Pontefract Castle and degraded his friends. A plot to seize Henry at a tournament was betrayed by Rutland and York; Kent, Huntingdon, Salisbury, and many other gentlemen were beheaded and in 1400 Richard died or was murdered.

Character. Richard was tall, well-built, and remarkably handsome, and gifted with great dignity and charm. He was artistic, a patron of literature and a lover of beautiful things, especially of fine jewels. His character has been variously interpreted. To some he is merely Richard the Redeless.

Others have ascribed his sudden absolutism to insanity. Yet he had proved his courage in 1381, he was deeply religious, with an especial devotion to Edward the Confessor, and his policy towards France and towards Ireland indicates real statesmanship. His "unconstitutional" actions may have been a carefully planned attempt to break the royal dukes, who temporarily

guage commonly used in schools in place of French.

RICHARD III (1452-1485). King of England. He was the youngest son of Richard, Duke of York, and brother of Edward IV, during whose reign he proved himself to be a successful soldier and administrator.

Richard was faithful to his brother, but on the accession of his nephew, Prince Edward, then 12 years old, his ambitions grew rapidly. As Edward was being brought from Ludlow to London, Richard of Gloucester arrested his escort on a charge of treason, and himself assumed the guardianship of the young king. Parliament confirmed his action by naming him "Protector." The Queen-Mother had taken sanctuary at Westminster with her younger son, the Duke of York, but she was forced to give this child also into the custody of his uncle Gloucester. The young Prince was lodged in the Tower along with his brother the King. See EDWARD V.

A Nation Estranged. Richard's ambitions were now revealed. He took advantage of the unpopularity of the Woodvilles and Greys, into whose family Edward IV had married in face of the opposition of the powerful Nevilles, to declare that Edward's marriage was invalid and his children consequently illegitimate. Parliament was intimidated into accepting the plea, and Richard, being next in the order of succession, was crowned. The Queen's relatives, Rivers and Grey, were executed, and soon after, the young princes in the Tower disappeared. Their fate is not known for certain, but in all probability they were murdered at their uncle's instigation. In consequence of the suspicions which immediately fastened upon Richard, there was a

revulsion of feeling against the House of York. In particular the Duke of Buckingham, who had hitherto supported him, now turned against Richard and leagued himself with Henry Tudor of Richmond, who had inherited the Lancastrian claim by virtue of his descent from John of Gaunt. The insurrection failed; Buckingham was captured and executed. Richmond, sailing from Brittany, failed to land, having learned that the local countryside was flooded and impassable.

But Richard was still surrounded by enemies, who feared that they might be marked down as the next victim of his violence. Their hopes of safety were centred in Richmond, and a scheme was set on foot to unite the House of Lancaster with that



RICHARD III
(National Portrait Gallery)

held both King and Constitution at their disposal.

During the reign, *Lollardy*, a movement of protest against Church abuses and privileges, took deep root in England. It arose out of the teaching of John Wycliff, once Master of Balliol. He gave expression to the growing impatience of the nation at papal encroachments, and attacked many of the religious practices and abuses of the day, such as the reverencing of images and relics, the sale of pardons, Masses for the soul, and the exercise of authority by those in sin. Wycliffe declared that the Bible was a sufficient guide for conduct, and he produced the first complete translation. During this reign English became the lan-

of York by a marriage between Richmond and Elizabeth, the Yorkish heiress. Richard countered this by proposing to marry her to his son, or alternatively to marry her himself. But his son died, and he feared to incur the additional unpopularity which would result if he set aside his wife, Anne Neville, for Elizabeth.

There were not many on whom he could rely. Lord Lovell, Catesby and Ratcliffe were his most trusted supporters, as the jeering rhyme bears witness—

"The Cat, the Rat, and Lovel the Dog,
Rule all England under the Hog"—

the Hog being Richard himself, who had chosen a white boar as his cognizance. Lord Howard, whom he had made Duke of Norfolk, was loyal, but he so strongly suspected Lord Stanley, whose second wife was the strong-minded Lady Margaret Beaufort, Richmond's mother, that he kept his son George, Lord Strange, as his personal attendant and a valuable hostage.

Bosworth Field. Henry of Richmond made his second attempt in 1485. He had on his side the whole Lancastrian interest, the Woodvilles and the Beckinghams. Richard found himself deserted by one after another of his former adherents. Henry landed at Milford Haven and marched through his native Wales into the Midlands. After fifteen days the rivals met at Bosworth in Leicestershire, and there the long feud of Lancastrians and Yorkists, known as the Wars of the Roses, was finally brought to a conclusion. There were defections from Richard's side on the actual morning of the fight. Northumberland withdrew his forces, and Stanley turned his weapons against the King. Richard's personal courage was unavailing. He fell, and Henry was acclaimed king on the battlefield.

Richard's reign is a record of lawlessness and crime, prompted by ambition, which transformed him from a loyal and efficient leader of men into a cruel and selfish tyrant. There is no doubt that he was personally brave and fearless. But he lived in an age of turbulent passions, and his destiny placed him at a point in history where the internal dissensions of the Yorkist families and the blood lust of the adherents of the White and Red Roses raged most fiercely. Moreover, his nearness to the throne made it inevitable that the struggle of factions should focus itself upon him, and he became at length involved in the universal destruction of the old nobility which marks the end of the Middle Ages.

Richard is usually represented as deformed in body. But this tradition may have arisen either from his name "Crouchback," or

from some malicious slander on the part of his Lancastrian enemies.

RICHARD OF CORNWALL, KING OF THE ROMANS (1209-1271). The younger son of John Lackland was created Earl of Cornwall in 1225 by his brother, Henry III, and sent to govern Gascony. In 1227 he returned, to become involved in the quarrels between the leading barons and the relations and favorites of the Provençal Queen. In 1238 he expressed great indignation at the marriage of Simon de Montfort, Earl of Leicester, to his sister Eleanor. The quarrel was healed, and in 1240 they went on Crusade, Richard being first reconciled to Henry.

Richard's second marriage in 1243 was to Saneha, sister to Queen Eleanor, and it strengthened his reconciliation with Henry. In 1256 died William of Holland, and in the next year four of the seven Electors chose Richard to succeed him as King of the Romans. Richard was crowned at Aix-la-Chapelle. His generosity gained him enthusiastic supporters but no real power, and he never received the Imperial title at Rome.

Richard failed as an arbitrator when the Barons' War began, and he sided with his brother. He was a prisoner from the battle of Lewes till after Evesham.

RICHARDSON, SAMUEL (1689-1761) The first of the great English novelists. He was born in Derbyshire, where he received an elementary education. In his seventeenth year he went to London and became apprenticed to a printer, and later he went into business for himself. In the year 1739, he was engaged by two booksellers to prepare a collection of letters on subjects of interest to those unable to compose their own letters.

Desiring to make the work interesting, he devised a plan whereby several imaginary persons exchanged letters, the whole forming a complete narrative. Thus his first novel, *Pamela*, was written. Published in 1740, when the author was over fifty, it is regarded by some critics as the first English novel, although many would give the title of "novel" to the narratives of Defoe.

The popularity of the book was immediate, and *Clarissa Harlowe*, published eight years later, met with an even more enthusiastic



SAMUEL RICHARDSON
Photo. Brown Bros.

reception. Five years later appeared Sir *Charles Grandison*. The fact that Richardson's novels were written in the form of letters involved him in a considerable amount of repetition, and the narrative is occasionally tiresome and overburdened with detail. His command over pathos is best seen in *Clarissa Harlowe*, and in all three of his novels he displays at times a genuine sense of humour.

RICHARD THE LION-HEART. See RICHARD I.

RICHIEU, *reesh' lyoe*, or *reesh' loo*, ARMAND JEAN DU PLESSIS, DUC DE, Cardinal (1585-1642). One of the most distinguished French statesmen, for eighteen years practically the absolute ruler of France. He was



CARDINAL RICHELIEU
Photo. C. S. I.

born in Paris of a family of the lesser nobility. His father, through his valour in the religious wars, gained for himself the gratitude of Henry III, and for his son the office of Bishop of Luçon, to which the young Richelieu was nominated in 1606, although almost five years under the canonical age.

His first taste of power came in 1614, when the clergy of Poitou elected him to the States-General, and he favourably impressed Maria de' Medici, the mother of King Louis XIII. When the States-General was dissolved, Maria retained the young bishop as court almoner, and in 1616 he was made a member of the Royal Council as Secretary for War and Foreign Affairs. A period of exile intervened, after which, in the good graces of Maria de' Medici, he renewed his way upward, securing through her efforts the rank of cardinal in 1622. Two years later he again became a member of the Royal Council, Minister of State, Foreign

relations engaged his attention first, and he arranged a marriage between Henrietta Maria, sister of Louis XIII, and the Prince of Wales, thus securing a friendly alliance with England. At home he wished to make the royal power absolute, to put down the rebellious Huguenots, and to crush the feudal nobility. He was not intolerant, and while limiting the political privileges given by the Edict of Nantes, he reaffirmed religious toleration, and thereby drew the loyal Huguenot officers to the support of his foreign enterprises.

To subdue the feudal aristocracy, he issued an edict in 1626, ordering all fortified castles, not needed for defence against invasion, to be destroyed.

Richelieu's greatest achievements were in the sphere of foreign affairs. When he came to power, Europe was embroiled in a religious war (see THIRTY YEARS WAR), and in this dissension he saw an opportunity for France. Henry IV had dreamed of crushing the Austrian Hapsburgs, time-honoured enemies of France, and now that the Austro-Spanish power had increased to a dangerous degree, Richelieu resolved to support the German princes with subsidies and good will, and encourage them in the struggle in the north; in the south he planned to help the Italians combat the encroaching Hapsburgs and Spaniards.

Richelieu's plans were temporarily interrupted by a revolt among the Huguenots, which dragged him into a war with England against his will. Later he persuaded Louis XIII to lead 30,000 men across the Alps to establish Charles Gonzaga, Duke of Nevers, in his legitimate possessions in Mantua. He also helped to secure the successful revolt of Portugal from the Spanish dominion.

By the treaty of Barwalde, on 13th January, 1631, he agreed to pay Gustavus Adolphus of Sweden £24,000 in consideration of his expenditure in the religious wars in Germany against the Hapsburgs and a sum of £80,000 a year for six years or until a general peace was made. Sweden's part was to keep an army of 30,000 in the field. Richelieu thus saved his country the enormous expense of a foreign war by subsidizing another to fight his enemy. A tangible result of these continental wars was the gaining of Alsace for France.

Although sometimes unscrupulous in his methods, his aim was always for the greatest good of France, whose boldest and most prudent servant he remained.

Apart from his statesmanship, Richelieu is remembered for his patronage and protection of literary men and the founding of the French Academy in 1635. He likewise rebuilt the Sorbonne and enriched it with

endowments, and at his death on 4th December, 1642, he was buried in the Sorbonne chapel.

RICHMOND, DUKES AND EARLS OF. Alan the Red aided his kinsman Duke William in the conquest of England and was rewarded by grant of some of the lands of Edwin, Earl of Northumbria. On them he built the castle of Richmond, from which his title came. He was succeeded in 1089 by his brother, Alan the Black. Another Black Alan, probably grandson of the first, married his kinswoman Bertha of Brittany. Their grand-daughter Constance married Geoffrey Plantagenet, brother to King John.

Both titles passed to Peter de Braine, husband of Constance's daughter Alice, but he ceased to acknowledge allegiance to Henry III, who conferred the Earldom on his wife's uncle Peter of Savoy and, after his death, on the Duke of Brittany. The titles were borne together with some intermission until the reign of Edward III. Henry IV granted the Earldom to his son "John of Lancaster," the warrior Duke of Bedford, on whose death in 1435 Henry VI gave it to his half-brother Edmund Tudor, son of Owen Tudor and Catherine of France. He married Lady Margaret Beaufort, daughter of John, Duke of Somerset, and great-granddaughter of John of Gaunt by his fourth wife Catharine Swynford.

Her son, Henry Tudor, Earl of Richmond, being descended from Plantagenet, was forced to live abroad during the reigns of the Yorkist Kings; legend says that Henry VI foretold his sovereignty. His mother kept him in touch with English affairs and, when in 1485 he came over from Brittany, her husband Lord Stanley led his forces to join him on Bosworth Field. Richmond, crowned as Henry VII, rewarded Stanley with the Earldom of Derby. The Countess of Richmond and Derby outlived her husband and died in the same year as her son. She founded the Lady Margaret professorships of divinity at Oxford and at Cambridge and endowed the Cambridge Colleges of Christ's and St. John's.

Henry VIII created Duke of Richmond and Somerset his illegitimate son Henry Fitzroy, who died without issue. In 1623 Ludovic Stuart, Duke of Lennox, a distant kinsman to the Royal House, was created Duke of Richmond, an honour conferred in 1641 on his nephew James. Charles, nephew to James, inherited. He married Frances Teresa Stuart, who at the age of fourteen, was sent to the court of Charles II by his sister Henrietta, Duchess of Orleans. She became Maid of Honour to Catharine of Braganza and one of the greatest beauties of a brilliant court.

In 1675 Charles Lennox, son of Louise de Kerouaille, was created Duke of Richmond by his father the King; from him is descended the present Duke of Richmond, Lennox, Gordon and d'Aubigny. The third Duke of this creation (1734-1806), a leading Whig of the Rockingham ministry, attacked the policy of coercion towards the American colonists and Ireland, and advocated manhood suffrage. In 1784 he joined Pitt's ministry and proved to have developed into a strong Tory. The fifth Duke was on Wellington's Peninsular Staff and later opposed Catholic Emancipation and supported the Corn Laws; his wife gave the famous ball at Brussels before Waterloo. He inherited the Gordon estates in 1836 and took the name of Gordon-Lennox. The sixth Duke held office in various Conservative ministries at the close of the nineteenth century; he was created Duke of Gordon.

RICHMOND, SURREY. This Parliamentary Borough is on the south bank of the River Thames, eight miles from Hyde Park Corner, London. At the 1931 census it had a population of 37,797. It includes Kew, Petersham, and a portion of Mortlake, and is famous for its natural charms of hills, parks and riverside. It is served by the Southern and District railways, and there are frequent bus services connecting with all parts of London. Richmond Park (2,255 acres) was enclosed by King Charles I in 1637, and is still Crown property. The town has many historical associations, and since the time of the Normans the Kings and Queens of England have had residences there. A few of the places of interest are Maid of Honour Row (erected in the reign of George I), some remains of the Old Palace (once the residence of Edward I), the Terrace Gardens (a famous beauty spot on Richmond Hill), Richmond Bridge (opened in 1777), the old Deer Park (with public recreation ground), Kew Gardens (288 acres the most famous botanical gardens in the world), and Kew Palace (James I). See Kew.

RICHMOND. See VIRGINIA.

RICHMOND. See YORKSHIRE.

RICHMOND, SIR WILLIAM BLAKE (1842-1921). An English painter and decorator, educated at Westminster School and at Oxford. As a young man he travelled in Italy, and his studies of Renaissance painters and of the Sistine frescoes had an abiding influence on the development of his art. In 1861 he exhibited at the Royal Academy, and frequently in later years. In 1878 he became Slade Professor at Oxford, and was made R.A. in 1895. Besides his numerous portraits and paintings on mythological subjects, he is chiefly notable as the designer of the mosaics of St. Paul's, London.

RICHTER, *rik'ler*, JOHANN PAUL FRIEDRICH, called JEAN PAUL (1763-1825). A German humorist and satirist. He was born at Wunsiedel, North Bavaria. His father, a clergyman, died when Jean Paul was 16. For three years (1781-1784), he attended the university at Leipzig. In 1787 he began teaching, and during this period (1787-1796), he produced many of his books.



JEAN PAUL RICHTER
Photo: Brown Bros.

As a master of satire, Richter gained a wide reputation, but his unlimited imagination and his emotional instability, brilliant as he was, made him a very unreliable writer, and one frequently difficult to understand. As a corner of words he is unsurpassed.

His books include *Levana*, *Extracts from the Devil's Papers*, *The Invisible Lodge*, *Hesperus*, and *Introduction to Aesthetics*.

RICKETS, *rik'ets*. A disease of the bones, most frequently found in children under 3 years of age. It is characterized by a rapid growth of the cartilaginous portion of young bones, but by little tendency to the regular change of cartilage into bone. The cartilage cells are not properly arranged, less than the normal amount of lime is deposited therein, and it is not regular in its distribution. In consequence, the soft bones bend into unnatural shapes, and unnatural knobs form. The most frequent deformities caused by rickets are bowlegs, knock knees, pigeon chest, funnel chest, rosary ribs, and knobbed forehead. As the child grows older, the bones harden, but they are apt to retain the deformities. Rickets results from lack of exposure to sunlight, such lack preventing the body from building up enough Vitamin D, the principle which causes bones to grow properly. This is also called the anti-rachitic vitamin.

The symptoms of rickets are tendency to sweat, especially in the head, weakness, flabbiness, and tenderness and distortion of the bones with accompanying pain. The teeth are late in appearing. X-ray examination of the bones establishes the diagnosis.

Prevention. Young children exposed to sunlight of good strength for several hours daily are protected against rickets. In the slums of large cities there is not likely to be

enough available sunlight for such protection. Therefore it is advisable to give such children opportunity to be radiated by ultra-violet rays. Where such exposure is not possible, cod-liver oil or, better, halibut-liver oil is given as a substitute. See BONE; HUMAN GROWTH; VITAMINS.

RICKSHAW. See JINRICKISHA.

RIDDLE. A variety of enigma, or puzzling question, to be solved by guessing or by conjecture; or a statement with a hidden meaning, which is to be discovered or guessed by the person or persons to whom it is addressed. The term has been extended to cover any proposition that is ambiguous, or anything puzzling, uncertain in its meaning, or intricate.

The earliest known riddles were those propounded by oracles and bards, and were of a serious character. They were genuine enigmas, now sometimes called *sense-riddles*, but the riddling of ancient times has degenerated into less serious forms.

There are riddles in the Bible, and the story of Samson in Judges xiv is a good example.

Among the ancients, the sun, the moon, the rainbow, and especially the wind, were the objects of riddles. "What flies for ever and rests never?" was a riddle referring to the wind. In Grecian mythology, we find the famous riddle of the Sphinx, "What animal goes on four legs in the morning, on two legs at noon, and on three legs in the evening?" When Oedipus guessed the answer, "Man," the Sphinx took it so much to heart that she killed herself.

By the Middle Ages, riddling had become a popular pastime. From an old collection we get this example of the riddles of this era—

What is it that never
was and never will be?
(A mouse's nest in a
cat's ear.)

RIDINGS. Administrative divisions of Yorkshire (which see).

RIDLEY, NICHOLAS (about 1500-1555). An English churchman, one of the early Protestant martyrs. He graduated at Pembroke Hall, Cambridge, where Tyndale and others already had spread the new doctrines, later, he studied in Paris and at the University of Louvain. After his return to England, he attracted the



BISHOP RIDLEY
Photo: Brown Bros.

attention of Archbishop Cranmer, who made him one of his chaplains, and later he was chaplain to Henry VIII. Ridley speedily became one of the leaders in the Protestant movement, and under Edward VI he acquired great influence.

In 1547 he was created Bishop of Rochester, and in 1550 Bishop of London; as a result of this promotion, he was appointed to assist in revising the English Prayer Book and in drawing up the Thirty-nine Articles. As an adherent of the Protestant side, he favoured the claims of Lady Jane Grey to the throne, and in consequence he found himself in a dangerous position on the accession of the Catholic Mary. In 1553 he was arrested, in the next year was brought to trial with Latimer and Cranmer, and in 1555 was found guilty of heresy and burned at the stake with Latimer.

RIDOLFI CONSPIRACY, THE In 1571 Mary Queen of Scots' representative, Leslie, Bishop of Ross, plotted with Philip II of Spain and the Duke of Alva, his Governor in the Netherlands, to murder Elizabeth, marry Mary to the Duke of Norfolk, and put them on the throne, if necessary with a Spanish army. Rudolfo Ridolfi, a Florentine banker, was the go-between. Charles Bailly, his agent, was arrested and revealed some facts, although he smuggled the most incriminating letters to Ross. Sir John Hawkins learned more from Don Guerau de Spes, the Spanish Ambassador, to whom he was posing as a malcontent. Ross was arrested and confessed, and Norfolk was executed. Whether Mary knew of the plot is still disputed.

RIENZI, re en' ze, COLA DI (about 1313-1354). Rienzi was born in Rome, the son of a tavern-keeper. A desire to free the city from oppression at the hands of its aristocratic governors was intensified by his wish to avenge the death of his brother, who had been slain by a noble. The Pope gave him his support, and by 1347 Rienzi was strong enough to call a meeting of the people on the Capitol and propose the revival of the old Roman Republic. As a result, new laws were drawn up and Rienzi was made tribune (which see), with practically unlimited power.

At first he ruled justly, if sternly, but his absurd ceremonials, together with his increasingly autocratic assumption of power, destroyed popular confidence in his sincerity. At the end of 1347, after a reign of only seven months, with the Papal authority now ranged against him, he fled to Naples.

He later sought to induce the Emperor Charles IV to take up the work of delivering Rome from the power of the nobles. Charles refused Rienzi's request, put him in prison, and a year later gave him up to Pope Clem-

ent, who kept him imprisoned at Avignon. When Innocent VI became Pope in 1352, he released his prisoner and sent him on a mission to Rome. The people received him with enthusiasm, and he was able within a few days to regain his lost power; but cruel and arbitrary acts on his part enraged the populace, and in October, 1354, a disturbance arose, during which he was killed.

RIESENGBIRGE, re zen gè beer' gè. A range forming the middle and highest part of the Sudetes Mts. in Central Europe, dividing Lower Silesia from Czechoslovakia. The Riesengebirge, whose name means "giant range," is formed chiefly of old crystalline rocks, but contains beds of coal and other minerals. The highest point is the Schneekoppe (Snow Peak), which is 5265 ft. above the sea.

RIFF, THE, OR ER RIF. A mountainous area on the north coast of Morocco, extending along the Mediterranean for about 180 miles. The hills are a part of the Atlas Range, and reach an altitude of 7000 ft., with a mean elevation of about 2000 ft. The inhabitants are Berbers, and of a warlike nature. Formerly, piracy was their favourite occupation, while their constant tribal uprisings for long caused trouble to Spain and France; they resisted alien invaders for over two thousand years.

In the spring of 1925, after a year or more of guerilla warfare, in which Spanish regiments failed to give a good account of themselves, the Rifians, augmented by many tribes drawn to the cause by the seeming success of Abd-el-Krim, attacked the power of Spain in earnest. The Spanish were driven to the coast within a few months, and they abruptly decided to abandon their efforts to capture the rebel leader. However, the French, fearing victory would whet the zeal of the tribes for further conquests, undertook a Moroccan campaign.

In April, 1926, Abd-el-Krim at length surrendered, and was exiled to the Isle of Réunion. See MOROCCO.

RIFLE. A firearm designed to be carried and manipulated by one man, which serves as an offensive and defensive weapon in war, and an instrument of sport. It is so called from the spiral grooving, or "rifling," in the barrel, which imparts a rotary motion to the bullet and insures greater accuracy of fire. Authorities differ as to the inventor of rifling; some point to a record of 1476, showing the invention of a weapon with a spirally grooved barrel, others say that the device was invented about 1520 by Gaspard Koller of Vienna.

In 1851 the first rifle firing an elongated bullet, instead of a metal ball, appeared. It was called the *Minié*, after its inventor of

that name, who was awarded 500,000 francs for his invention by the French government. The Minie rifle, with a bayonet attached, was used in the Crimean War (1854). It fired a charge of $2\frac{1}{4}$ drams of powder, and was sighted for from 100 to 1000 yds.

Between 1857 and 1861, Westley-Richards, Sharp and others introduced breech-loading



RIFLE MANUFACTURE

Assembling Service rifles at the Royal Small Arms factory at Enfield

Photo: Photopress

guns, but breech-loading rifles were not adopted universally in Europe until 1867. The Prussian Needle Gun and the French Chassepot were used in the 1870 campaign; Britain adopted the Snider rifle and later the Martini-Henry, the latter remaining in use almost to the twentieth century.

Then came the introduction of the magazine principle, to ensure quicker firing. The Winchester was one of the earliest magazine rifles, and was used with great effect in the Russo-Turkish War of 1877. In the Winchester rifle, the cartridges were loaded into a tube under the barrel, and were forced into the chamber by the action of a lever which opened and closed the breech. The introduction of smokeless powder in the last part of the nineteenth century was an enormous advantage to rifles and increased their use.

The Lee-Metford, followed by the Lee-Enfield, were the first magazine rifles in the British Service and were used in the South African War; the magazine contained ten cartridges. About 1906, the Short Lee-Enfield, with its long seventeen-inch bayonet, was adopted and used throughout the World War. It measures slightly over 44 in. and weighs under 9 lb. without the bayonet, which adds another pound. The magazine is fitted under the breech, in front of the trigger-guard, and is loaded with a clip or charger of five cartridges; the magazine will accommodate ten rounds.

The bore of the Short Lee-Enfield is .303,

which is slightly larger than that of the rifles of the Central European Powers.

The bullet is cupro-nickel covered with a lead core, and weighs 174 grains; it is propelled by 39 grains of cordite, and is sharp-pointed, having a muzzle velocity of 2440 ft. per second and a range of over 4000 yds.

By 1906 most of the improvements on rifles had been made, and types used by the armies of foreign countries were of about the same efficiency. All weighed about 8 or 9 lb. without their bayonets, were between 49 and 52 in. long, with calibre of .315, .311, or .276, and sighted for over 2000 yds. The following are the distinctive types: Great Britain, Short Lee-Enfield; Germany, Mauser; Austria, Mannlicher; France, Lebel; Norway and Denmark, Krag-Jorgensen; Russia, Three Line Nagant; and the United States, Springfield.

When tanks began to appear in the World War, an anti-tank rifle was introduced, but it was too heavy a weapon to be fired from the shoulder. In 1935 the British Army adopted two anti-tank guns, one a heavy rifle.

The most recent development in rifles is an attempt to make them automatic—that is, to use the power derived from the explosion of the charge to reload the gun.

In the rifles used for sport—hunting and target practice—the size and power of the rifle are determined by the type of game.



AIMING AND FIRING IN LYING DOWN POSITION

Both elbows should rest on the ground and the left wrist should be well under the rifle.

(Courtesy: H. M. Stationery Office)

The most important meeting in the world for competitive rifle shooting is held in England at Bisley each year.

RIFLE-BIRD. A common name for several Australian birds of paradise. They have a characteristic long curved bill and short wings.

RIFLING. See RIFLE, ORDNANCE.

RIGA, re'ga. The capital of Latvia (which see).

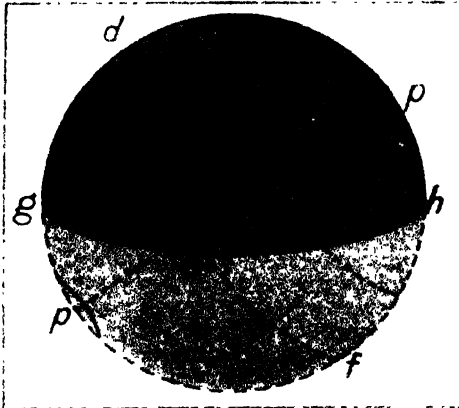
RIGA, OR LIVONIA, GULF OF. An inlet on the east side of the Baltic Sea, about 100

miles long from north to south, and 70 miles wide. See physical map in the article **EUROPE**.

RIGEL, *ri' jel*. Seventh among the stars in brightness. See map in **ASTRONOMY**.

RIGGING. See **SHIPS AND SHIPPING**.

RIGHT ASCENSION AND DECLINATION OF STARS. As the position of places on the earth is described by the terms *longitude* and *latitude*, so is the position of heavenly bodies defined by the terms *right ascension* and *declination*. It must be remembered, however, that the position of heavenly bodies is stated with reference to



DEFINING POSITION OF STARS BY RIGHT ASCENSION AND DECLINATION

(a) Vernal equinox, (b) point at which great circle from pole through star meets the equator; (c) position of star, (d, e, f) celestial equator, (g, h) horizon of person standing at (a)

the *celestial equator*. On the earth, Greenwich is the starting-point of measurement of longitude. In the heavens, the point of reference is the "first of Aries," or the vernal equinox. Thus the right ascension of a star is ascertained by drawing an imaginary great circle from the celestial pole through that point to the celestial equator. The measurement of the arc of the equator, from the first of Aries, or vernal equinox, to the point on the equator where the great circle crosses, is the right ascension of the star (*a b* in diagram). The *declination* is the distance north or south of the celestial equator, measured on the arc of the imaginary great circle from the equator to the star (*b c* in diagram).

RIGHT OF WAY. See **EASEMENT**.

RIGHTS. A complex conception of great importance in law and ethics. The noun "right" must not be confused with the adjective "right"; doubtless there is a connection between the two (both being derived from the Latin *rectus*), but they have

come to stand for two wholly different conceptions both in law and ethics. The conception of a *right* is not capable of any simple definition. All simple definitions are unsatisfactory, because they necessarily presuppose that the noun "right" has fundamentally one single meaning, whereas it will be found on analysis to have several quite distinct meanings. In law, the noun "right" is used in four different senses, viz. (a) a *claim* enforceable at law, (b) an *interest* or *title* recognized by law, (c) a *liberty* guaranteed by law, and (d) a *power* conferred by law. Thus (a) where *A* owes *B* £100, *B* is said to have a right to be paid, i.e. he has a *claim* enforceable at law against *A*; (b) an owner, a lessee and a mortgagee of a piece of land are said to have different rights in the land, i.e. they have different *interests* in or *titles* to it; (c) when I say that I have a right (within certain limits) to do what I like with my own property, I mean that the law guarantees me the *liberty* (within those limits) of doing what I like with it; and (d) when it is said that by English law anyone of full age and of sound mind has the right of making a will, what is meant is that any such person has the *power*, conferred by law, of making a will. By the medieval jurists rights in the sense of claims were called rights *in personam* (rights against a person) while rights in the sense of interests were called rights *in rem* (rights over a thing). In ethics, the conception of a *right* is also highly complex and seems on analysis to resolve itself into three distinct notions, viz. (a) claims, (b) titles, and (c) liberties. Thus (a) where it is said that *A*, having done *B* a service, has a right to some return from *B*, this means that *A* has a moral *claim* upon *B* to make a return for the service, (b) when it is said that every nation has the right to determine its own form of government, what is meant is that every nation is morally *entitled* to this degree of self-determination, and (c) when I ask myself "How far have I the right to put my happiness before the wishes of my parents?" I mean "How far am I morally *at liberty* to put my happiness first in this way?" In the sixteenth, seventeenth and eighteenth centuries political philosophy (Hobbes, Grotius, Locke, Rousseau, Paine, etc.) and, later, active politics were greatly concerned with the question of the "natural rights" of man, i.e. the benefits to which a human being must be considered to be morally entitled simply by virtue of being a human being. Great confusion of thought prevailed, owing chiefly to the failure to distinguish the different meanings of *right*, so that Bentham in despair was led to deny that there could be any rights other than legal rights. This conclusion has not

been accepted by philosophers generally. See **ETHICS**; **LAW**.

RIGHTS, DECLARATION OF. Formulated in 1689, this was the work of a Convention of the lords and representatives of counties and boroughs, summoned after the flight to France of James II. It asserted, in a single document, the title of William and Mary and their descendants to the English Crown and the ancient liberties of the people. After reciting the abuses of the previous reign and the facts of James's abdication and the consequent vacancy of the throne, it proceeded to condemn the use of the suspending power and of the dispensing power as it had been exercised of late; the setting up of courts outside the ordinary scope of the law; the levying of money otherwise than by obtaining grants from Parliament; the keeping of a standing army in time of peace, without the consent of Parliament; the questioning outside Parliament of its debates; the demanding of excessive bail. It declared that elections to Parliament should be free, and that Parliaments should be held frequently. The succession to the throne was settled on William and Mary during their joint lives, William alone having for that period the power of administration; and, after the death of the survivor of them, on William's heirs by Mary; and then on Anne of Denmark and her heirs, and finally on any other heirs of William. The Declaration was presented to William on the 13th of February, 1689, and subject to its terms he was offered, and he accepted, the English crown. Some months later, the Declaration was embodied, with slight amendments, in the Bill of Rights.

RIMSKY-KORSAKOV, NICHOLAS ANDREIEVITCH (1844-1908). One of the finest of Russian composers, and perhaps the best known of the "five" who rescued Russian music from undue subservience to Germanic influence. He wrote many sacred works, three symphonies, and the famous *Scheherazade* suite for orchestra, a masterpiece of colour in sound, but his greatest achievement lies in his long series of operas, mainly based on characteristic Russian fairy-tales. Technically, his first asset was an incomparable skill in orchestration, and his book on orchestration is one of the most important treatises on the subject. His melody is always fresh and spontaneous. Though he did not always trouble to be original in his musical ideas, when he took trouble, no music is more original. At the end of a long life he created his masterpiece, the opera *Cog d'Or*; perhaps the most gem-like of operas since *Die Meistersinger*.

RINDERPEST, rin' der pest, or CATTLE PLAGUE. An acute, infectious disease which

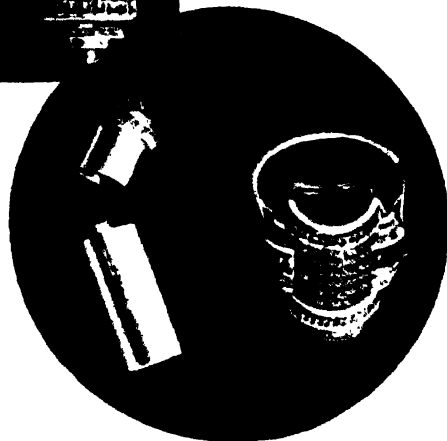
attacks cattle and occasionally sheep. On the continent of Europe it has been a most serious plague since it appeared in the fourth century. From 60 to 90 per cent of the animals attacked die, but if an animal survives, it is thenceforth immune. The source of infection is believed to be a minute organism which may be carried in the manure, or by sick animals, or on the clothing of attendants. The disease shows itself by a high temperature and a rapid pulse. The milk supply stops. The next stage is marked by congestion of the mucous membranes of the mouth, throat, etc., and by the appearance of ulcers. Death is likely to ensue within four to seven days. No certain cure has as yet been discovered.

RING. A band of gold or other precious metal, usually worn on the finger. Primitive peoples have worn rings suspended from the nose or lips, and upon the arms, neck, legs, and toes. The earliest rings known are



VANITY RING
Set with sapphires and diamonds, it contains a miniature lip-stick case.

Photos: Maffey and Welch



those found in the tombs of ancient Egypt. The custom grew out of a love of ornamentation, but gradually took on a more significant aspect. Kings passed their rings to trusted servants, that they might have the full authority of the king himself. The signet ring with some distinctive device took the place of the purely ornamental ring. The use of betrothal or engagement and wedding rings originated with the Jews.

In addition to an ornament, a ring has always been regarded as a symbol of

authority, confidence, and love, and still plays an important part in the coronation of kings and in the consecration of bishops.



MODERN ORNAMENTAL RINGS

Photos: Mappin and Webb

Until the fourteenth century, thumb rings were commonly worn, and Falstaff boasted that, although he was enormously fat, he could, in his youth, "creep into an alderman's thumb ring."

The ring of the Pope is of especial interest. It is presented to him at his coronation, and bears his name and a picture of Saint Peter in a boat. It is sometimes called the "fisherman's ring."

RING-DOVE OR **WOOD-PIGEON**. See DOVE; PIGEON

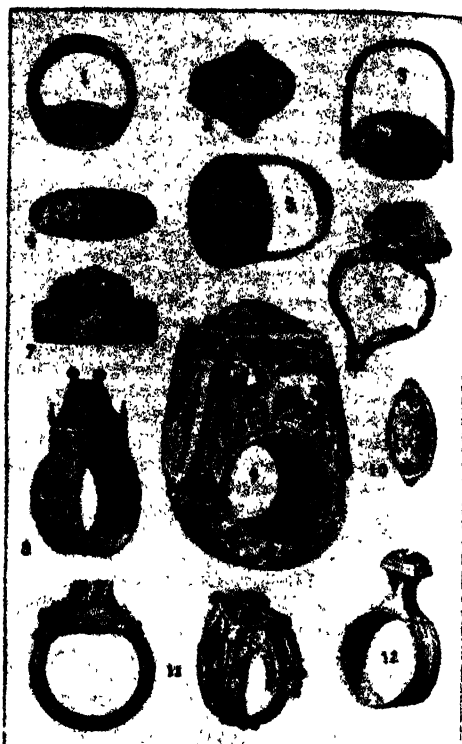
RINGWOOD. A market town of Hampshire, standing on the River Avon, about twenty-five miles from Southampton. It is on the edge of the New Forest, and is served by the Southern Railway, being 103 miles from London. The population at the last census was 4600. The town has brewing and glass-making industries.

RINGWORM. The general name given to several forms of skin disease caused by minute vegetable organisms, or fungi. Common ringworm of the skin, often seen on children, begins as a small red area the size of a split pea. As this grows larger, the inside clears, and the eruption appears as a red, scaly ring. There may be one or several patches. This form of ringworm occurs on the non-hairy parts of the body, is contagious, but is easily cured. If the spots are painted every two or three days with tincture of iodine or mercurial ointment, they will disappear. Body ringworm, which may attack persons of any age, consists of flat, yellowish or brownish patches of varying sizes. It appears on the neck, back, chest, and abdomen. Iodine should be applied.

Ringworm of the hands and feet is another common ailment, and has three types. A white sodden area between the toes, especially the part adjacent to the little toe, is evidence of *interdigital* ringworm. It usually causes no discomfort, but is sometimes followed by the *vesicular* form, which gives rise to eruptions of blisters on the hands and feet. Less common but more persistent than these forms is *keratotic* ringworm, usually limited to the palms and soles. The affected areas are very dry, slightly thickened, and

slightly reddened. If iodine does not cure attacks of these types of ringworm, ray treatment may be tried.

There is also ringworm of the hairy parts of the body. Children are especially susceptible to ringworm of the scalp. Ray treatment is the most reliable remedy. A ring-



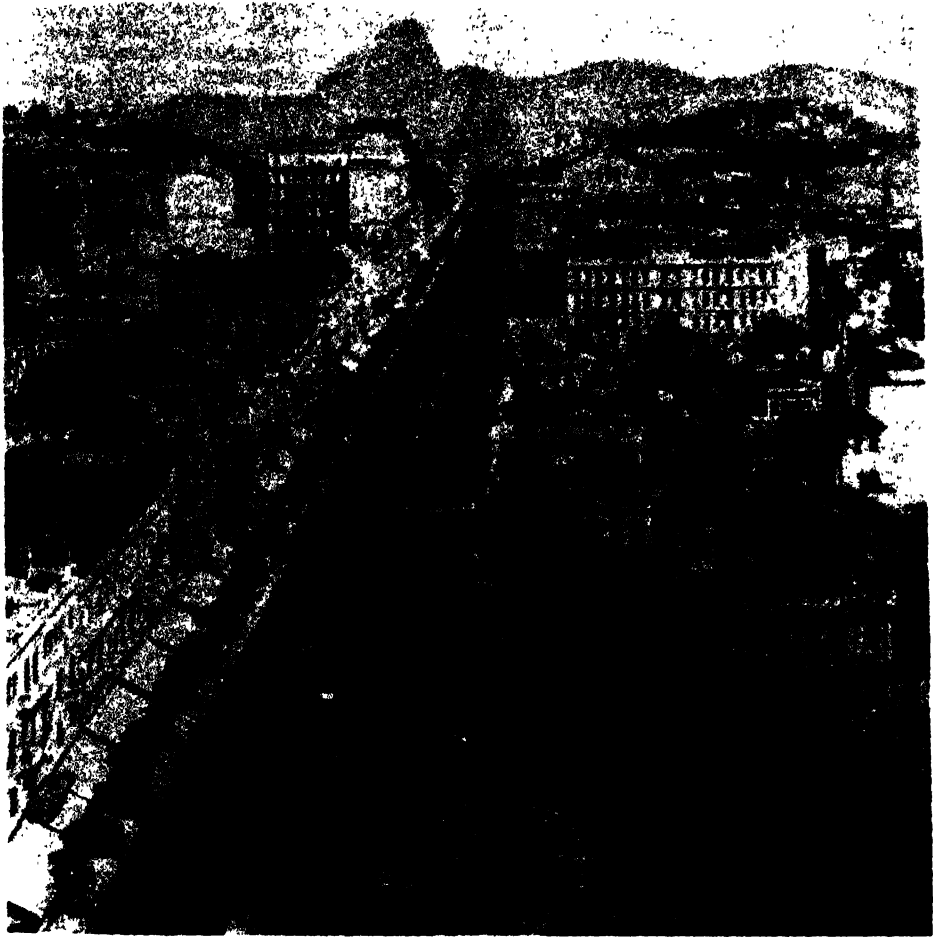
OLD FORMS OF RINGS

- 1 Ancient Egyptian ring
- 2 Gold ring from Mycenae.
- 3 Egyptian signet ring
- 4 Roman gilt bronze ring.
- 5 Grecoan gold ring.
- 6 Gold signet of a Brahmin
- 7 Anglo Saxon betrothal ring.
- 8 Jewish marriage ring
- 9 Papal ring, fifteenth century.
- 10 Betrothal ring, seventeenth century.
- 11 Wedding rings of Luther and Katherine
- 12 Merovingian ring.

worm of the bearded part of the face is called *barber's itch*. See ITCH.

When ringworm appears in a family, each affected person should exercise special precautions, using his own comb, towel, washcloths, and other personal articles.

RIO DE JANEIRO, *re' o de jan air' o*. Situated on the most beautiful harbour in the world, this is the capital and metropolis of Brazil. It has a population of 1,700,000 (1935 estimate). Since 1834, the city, with



RIO DE JANEIRO

Avenida da Branca, principal thoroughfare of the capital of Brazil

its suburbs, has formed a Federal district, detached from the state of Rio de Janeiro. Niteroy, across the harbour, is the capital of the state. See BRAZIL.

The city is situated on the west side of the Bay of Rio de Janeiro, which stretches inland for several miles. The city owes much of its beauty to the fact that it is built on the flat land and low, wooded hills between the mountains, the spurs of which project in some places almost to the margin of the bay and form picturesque valleys within the city limits. The most famous of the parks is the Botanical Garden, above which, on the peak of Corcovada, there is a colossal statue of Christ, standing with arms outstretched. One of the most notable buildings is the National Museum, once the resi-

dence of the Emperor Dom Pedro II. It now contains the most valuable collection of books in South America.

A magnificent bay-side boulevard, the Avenida Beria Mar, curves around the water front.

About the year 1900, Rio de Janeiro began to realize that its position as the shipping port for the richest, most productive, and most thickly-populated region of Brazil required extensive harbour improvements, these have been completed at great cost. The entrance to the harbour is open to the largest vessels, and inside there is room for the navies of the world. Both hydraulic and electric power are available for loading. Besides the enormous coffee output, the city's exports include sugar and tapioca.

tobacco and cigars, meat and hides from the great cattle plains of the south and west, and cabinet woods from the forests.

RIO DE LA PLATA, *re' o de la plah' ta*. The estuary formed by the Parana and the Uruguay Rivers on the south-eastern coast of South America. It extends north-westward from the sea for about 170 miles.

RIO DE ORO. A Spanish colony in North-western Africa, bordering the Atlantic Ocean on the west and reaching the Sahara Desert on the east. Its greatest length is from the boundary of Morocco southward; the estimated area is 65,500 square miles, and the white population is only about 500. The colony is governed from the Canary Islands, with a local headquarters at Villa Cisneros, a small village on the sea-coast. Attached to it is the protectorate of 34,700 sq. miles and occupied territory of 9000 sq. miles.

RIO GRANDE, *re' o grahn' day*. A large river which forms about half of the boundary line between the United States and Mexico. Total length, about 1500 miles.

RIO MUNI. A Spanish colony in the Gulf of Guinea, West Africa, with an area of 9470 sq. miles. Most of it is low-lying and densely forested. The population is estimated at 89,000 negroes and 130 Europeans. The chief trading centre is Bata. In 1935 Rio Muni was renamed Continental Guinea, together with the island of Annobon and Corisco Bay. With Fernando Po, Rio Muni is under a Spanish Governor-General.

RIO NEGRO, *nay' gro*. One of the chief affluents of the River Amazon; it rises in Colombia. Total length, 1100 miles.

RIOT. See UNLAWFUL ASSEMBLY.

RIPIARIAN, *rip air' ian*. **RIGHTS**. The owner of land bordering on a stream that is not tidal owns that portion of the bed of the stream which adjoins his land, as far as the central line or middle of the stream. He is also entitled to his share of the water for such uses as will not impair its availability for any purpose farther down the stream.

These rights are known in law as *riparian rights*, and the owner is known as a *riparian proprietor*. The term is derived from the Latin *ripa*, meaning "river bank." Its use has been extended to embrace the rights of a landowner whose property borders a lake.

RIPON. Situated about midway between Northallerton and Harrogate, on the London and North Eastern Railway, is the Yorkshire inland holiday and health resort of Ripon (population 8418). It is a cathedral city and claims historical associations extending beyond the year 886, when certain minor self-governing privileges were conferred upon the few inhabitants dwelling round the monastic church of SS. Peter and Wilfrid.

The stately Minster dominates the city.

Its Norman Chapter House and Apse are of particular interest, as are the ruins of the hospital of St. Anne not far from the Minster. Adjoining the latter is a fine fifteenth-century building known as the Thorpe Prebend House, which is now a museum. Another historic building is Wakeman's House, a quaint medieval dwelling (probably thirteenth-century), also now a museum. It is the former residence of the Wakemen (mayors).

The Spa water is noted for its healing properties in skin diseases, rheumatism, and similar complaints. The Spa Pump Rooms and Baths were erected in 1905.

RIVER. A river usually has its beginning far up in the mountains or hills, with a little spring or a melting glacier for its source. As it flows on, other streams join it, and it continues to increase in volume. The river wears for itself a channel, the bottom of which is known as the *bed* of the stream, while the sides are the *banks*. The *right* bank of a river is that on the right hand of the observer when he is facing downstream. A river and all its tributaries constitute a *river system*. The area drained by a river system is known as the *river basin*. Heights of land which separate rivers and river systems are known as *watersheds* or *divides*.

The course of a river is divided into three parts—the upper, middle, and lower courses. In the upper course, the slope of the channel is steep and the current is swift.

The channel has been worn down rapidly and the banks have a steep slope, sometimes being nearly perpendicular. The water carries quantities of sand and gravel and sometimes rocks of considerable weight, which are borne along by the current, constantly wearing away the bed of the stream. The swiftness of the current enables it to remove most of the obstacles in its course, and the channel is free from small curves.

The river enters upon its middle course when it leaves the mountainous or hilly region in which it rises, and enters the lower lands, where the slope is more gentle. Its gradient now is less steep.

The current is not swift enough to carry the heavy material that it has brought down to this point, and this is deposited on the bottom of the channel. For this reason, the beginning of the middle course of many rivers is marked by gravel beds. Since the channel is worn more slowly, the slope of the banks is more gentle and the valley broader. Because the current has lost much of its velocity and cannot remove obstacles, it must flow around them; thus the middle course is characterized by numerous curves, some of which may take the river miles out of the general direction of its flow. Again

obstructions in the middle of the channel collect silt, which may form islands.

The lower course of a large river differs but little from the middle course. The current is slower, and the continuous deposit of silt raises the bed of the stream. Its gradient now is only a few inches a mile. Frequent overflowing of the low banks may form vast flood plains which make good agricultural land.

Cataracts and Canyons. Rivers frequently flow over rocks of unequal degrees of hardness; the softer rock is worn away, leaving the harder as an obstruction. These conditions are usually found where the current is swift, and rapids or cataracts are formed. The cataracts of the Nile and the rapids in the St. Lawrence are good illustrations. In mountainous regions, the swift current sometimes wears a deep channel with vertical walls, forming a canyon. The Grand Canyon of the Colorado was formed in this way.

Estuaries and Deltas. A river flowing slowly into an arm of the sea, protected from great waves and high tides, deposits its silt at its mouth and builds up an alluvial plain called a *delta*. The deltas of the Nile and the Mississippi are excellent examples of such formations. When the bed of the river in its lower course slopes into the sea, forming a drowned valley up which the tides

extend without obstruction, the silt is carried away and the mouth of the river remains a broad estuary.

RIVERA Y ORBANEJA, MIGUEL PRIMO DE, MARQUIS DE ESTELIA (1870-1930) Born at Jerez de la Frontera, he was educated at the military academy at Madrid and saw active service in Morocco, Cuba, and the Philippines. He



PRIMO DE RIVERA
Photo Fox

became Governor of Cadiz in 1915 and Captain-General of Madrid in 1919, but his tenure of both offices was shortened by his criticisms of political intrigue. In 1923, a year after his appointment as Captain-General of Catalonia, he established himself as head of a Military Directory. Spain was on the verge of anarchy, and had suffered in 1921 a severe defeat from Abd-el-Krim's Riffian tribesmen, so that his seizure of power was welcomed. He showed able statesmanship, restoring order and improving Spain's international relations. The Riff was again brought under control. His con-

tempt of parliamentary institutions proved disastrous, for he did not have his régime legalized by the Cortes; and his actions were therefore unconstitutional, a fact which lost him much support and was one cause of his fall. He was also out of sympathy with King Alfonso XIII, and this lack of harmony weakened his position. He retained the unpopular system of conscription and found the influential Army increasingly difficult to handle. In 1930 he infringed on the royal prerogative by seeking a decision from the military commanders on his retention of office and was inevitably dismissed by the King. His absolute rule had been marked by singular mildness to political opponents.

RIVER HOG. A wild pig, several species of which are found in Africa. They are distinguished from the true Hogs by a long tuft of hairs on the tip of the ears, and by the hair of the male being thick and bristly and generally brightly coloured.

RIVERS, RICHARD WOODVILLE, FIRST EARL. See WOODVILLE.

RIVIERA, riv eer' a. Along the Gulf of Genoa, at the northern end of the Tyrrhenian arm of the Mediterranean Sea, is the favoured strip of land familiar as "the Riviera," though actually made up of three continuous sections—the French Côte d'Azur and the Italian "Western" and "Eastern" Rivas. Extending for a distance of about 170 miles between the mountains and the sea, it provides a winter resort and playground for travellers from all over the globe. The sun and the south winds warm it, while the Alps, in the background, shut off the north and east winds. From Antibes in the west to Spezia in the east, the towns and villages are almost continuous.

The Riviera towns include Nice and Mentone, in France, Monaco and Monte Carlo, in the principality of Monaco, and Bordighera, Ospedaletti, San Remo, Rapallo, Genoa, and Spezia, in Italy. These are connected by railway, which follows the same route as the remarkable Corniche Road, built by the Romans, improved by Napoleon, and widened in recent times.

RIZA SHAH PAHLEVI (born 1878) Shah and "strong man" of Persia, who rose from a position as private in the Shah's Cossack bodyguard to sovereign heights in the Persian government.

In 1917 Riza Shah forced the commander of the Cossack division to relinquish his office, and in 1921, with about 4000 men, he captured Tehran, became commander-in-chief of the Persian army, overthrew the existing Ministry, and set up a new Cabinet. He took over the post of Premier in 1923, instituted a series of reforms, and modernized the various departments.

In 1925 the Shah was deposed and in December, Riza Shah was placed at the head of a temporary government; in April, 1926, he was raised to the royal dignity. See PERSIA.

RIZZIO, *ril' se o*, DAVID. See MARY QUEEN OF SCOTS; DARNLEY, HENRY STUART.



ROACH

ROACH. One of the commonest of British fresh-water fishes, this is a very well-known member of the carp family. It provides sport for countless thousands of anglers who have a great respect for the roach's cunning and shyness. Lines of gossamer lightness are used, together with tiny baits of wheat or bread-paste. The roach is a handsome fish with silvery sides, olive back and reddish fins. It grows to a weight of over 3 lb. in some English rivers and lakes, but a 2 lb. fish is usually considered a large one. It is of little or no value as food.

Scientific Name. *Rutilus rutilus*

ROAD CHARGES. See HIGHWAY.

ROAD FUND. See HIGHWAY.

ROAD-RUNNER. Known also as the Chaparral Cock and Ground Cuckoo. A swift-footed bird of the cuckoo family found

ROAD-RUNNER
Photo: Wide World

in the south-west of the United States and in Northern Mexico. When it runs it spreads its wings and tail and speeds along at an amazing pace. The bird is nearly 2 ft. in length and has long legs with two toes at the front and two at the back. From two to nine whitish eggs are laid in the nest which is made of sticks and placed in low trees or bushes. The road runner feeds on insects,

mice, lizards, snails, young snakes and birds, with some fruit.

Scientific Name. The road runner belongs to the family *Cuculidae*. Its scientific name is *Geococcyx mexicanus*.

ROADS AND ROADMAKING. In the earliest times man probably preferred to travel by water rather than by land, for transport by boat along the rivers and round the sea coasts would be relatively safe and easy compared with the many difficulties of a journey by land. The labour of making a trackway was great. In Britain, before the time of the Romans and for centuries afterwards, the country was largely covered by dense forests and undergrowth, infested by wolves and bears, while most of Cambridge and Lincolnshire was a marsh. The chief exception was the Downland, and it was along the edge of the Downs that the first tracks were made. The Icknield way connected the agricultural district of the Iceni in Norfolk to the Downland civilization of Avebury and Stonehenge. It ran over the Chilterns and Wiltshire Downs and was joined at Avebury by tracks from Sussex and the Cotswolds.

Land transport was on foot or with the help of pack animals. Wagons were little used. No one knows who invented the wheel. Chariots with spoked wheels are shown in ancient Egyptian and Babylonian carvings, but in some South American civilizations the wheel was apparently never discovered at all. Julius Caesar mentions that the Britons had chariots with solid wheels and elongated axles to which were fitted scythes for mowing down the enemy in battle.

The Romans were of course the first great road-builders, they made them primarily for military purposes. They improved the ancient trackways such as the Icknield Way, and built many new ones. Watling Street ran from Richborough through London and Worcester to Festinog in North Wales. From there one branch went to Caernarvon and the other to Chester, Manchester and the North. Akeman street ran from the Eastern Counties through Bedford, Buckingham, Alcester, Woodstock, Cirencester to the Severn at Aust. It continued on through Wales via Caerleon, Cardiff, Carmarthen to St. David's in West Pembrokeshire. Ryknield Street went from the Tyne to Carmarthen via Bruchester, Bolton, Chesterfield, Birmingham, Tewkesbury, Chepstow and Abergavenny. Ermin Street ran from Scotland to London and thence to Chichester and Pevensey. Bath was connected to Lincoln by the Fosse Way and to St. David's by the Via Julia. It was these roads that made the military occupation of Britain possible, for by forced marches the Legions were quickly able to strike at rebellion.

After the Romans left, the roads were almost completely neglected, the stones often being taken for building. The Normans improved the routes to the South Coast sea-ports, but those to the north were still very bad. The tracks, such as they were, were used by pack animals and were gradually worn so deep that the animals were invisible from the surrounding fields. The tracks be-



ROAD PLANNING

An experimental model of a bridged six way distributor road crossing. Provision is made for four lines of moving traffic, a minimum of level cross overs, and adequate parking space.

Photo: Photopress

came known as Holloways and their entrances into cities as Holloway Ends. This is the origin of the name in London and other cities.

Improvement came in the reign of Edward III. It was then the policy of the English kings to enrich the country by fostering crafts and industries, and this involved improved communications between the towns. The first toll road was opened in 1346 from St. Giles-in-the-Fields to Charing and Temple Bar. Previously the road at Temple Bar was impassable in bad weather, and when the king opened parliament the holes had to be filled in with faggots. The rivers were still much used and were deeper and more navigable than they are now. It was not until Tudor times that it became the

duty of the parish to keep the roads in good condition, two surveyors being appointed who could use forced labour if necessary. Wheeled vehicles gradually became more common, and stage coaches were run in the seventeenth century. About this time the turnpike system was started, by which tolls were charged for the use of the roads, the charge for a four-horse coach being as much as 3½d. a mile. This system was much extended after the 1745 rebellion, in which the Government was nearly defeated owing to bad transport facilities. Turnpike trusts could be privately owned and were not managed efficiently. Travel was still very slow; the journey from London to Edinburgh took a fortnight, though the flying coach from Manchester to London did the journey in the "incredible" time of four and a half days. And travellers still complained of ruts being four feet deep.

The Industrial Revolution made reform necessary. Much traffic was then being carried by the canals, but the roads had to be improved, and in 1827 the Metropolitan turnpikes were abolished. The end of the turnpike era came fifty years later when the state voted £250,000 for the upkeep of the highways, and made local governments responsible for their maintenance. In 1919 the Ministry of Transport was formed as a central authority. In 1936 the Ministry took over from the local authorities, responsibility for the construction and care of "Trunk" roads.

Roadmaking. Modern roadmaking dates from the work of Telford and Macadam, who were active at the beginning of the nineteenth century. Macadam used the system of broken stone surfaces which is named after him.

The subsoil must first be adequately drained so that it is hard and dry. A layer of clinker is then put on top, and after this comes the foundation. The latter was thought to be unnecessary by Macadam but was advocated by Telford, who had stones 7 in. deep and 3 in. wide placed together by hand with smaller stones to fill in the cracks. This method is still used, though foundations may also be made by shovelling out stones from a cart followed by rolling. They may also be made of concrete.

Surfaces are of various kinds. Waterbound roads have a surface of small stones held together by a slurry of fine stone particles and water. Such roads require constant watering. In tar macadam the stones are held by a mixture of tar and bitumen. Asphalt surfaces are made from bitumen without tar, mixed with stone, sand or cement. Roads paved with wooden blocks are often seen. A soft pine wood is best as it wears evenly. The blocks are usually 9 in.

by 4 in. by 3 in., impregnated with creosote and laid with the grain vertical. Such roads always have a concrete foundation. Roads with a concrete surface are also made but are not much in favour owing to the expense and tendency to crack.

In planning a road, 10 ft. should be allowed for each carriage-way, with a minimum gradient of 1 in 200 to drain away



LAYING AN EXPERIMENTAL IRON ROAD SURFACE

Photo: Photopress

water. The camber should be as little as is consistent with getting the water away from the centre. Other considerations, such as gradual curves and good visibility at cross-roads, are sufficiently obvious, and not least is the necessity for abolition of hoardings in the midst of the country.

ROBBERY. In criminal law, robbery consists in unlawfully taking from a person by violence or intimidation money or goods to any value whatever. This crime is classed as a felony, and is punishable with penal servitude up to fourteen years. If the robber is armed, or accompanied by another, or actually uses violence to the person, he may be sent to penal servitude for life; a male robber may also be whipped. Robbery is an aggravated form of larceny.

Attempted robbery is a common law misdemeanour, and assault with intent to rob (which is, of course, itself an attempted robbery) is a statutory felony punishable with penal servitude up to five years, or, if the prisoner was armed or accompanied

by another, for life. See **BURGLARY**; **LARCENY**.

ROBBIA, DELLA. The name of a family of Italian sculptors of the early Renaissance.

Luca della Robbia (1399-1482) was born and died in Florence. He exercised his greatest influence as the founder of a school of sculpture in which the medium used was glazed or enamelled terra cotta.

Luca della Robbia was distinguished for his work in marble and bronze, as well as for his reliefs in terra cotta. He designed and made ten panels of angels and dancing boys and a great bronze door for the cathedral at Florence.

Andrea della Robbia (1437-1525), the nephew and pupil of Luca, made a much wider use of terra cotta. He adorned churches at Arezzo, Prato, Siena, and Florence, but only his earliest work embodies the dignity which always characterized the achievements of his uncle.

ROBERT. The name of a Duke and two Kings of France.

Robert the Strong, Count of Anjou and afterwards Duke of France from 861 to 866, founder of the line of the Capets; he was the father of Odo, king of the Franks (888-899), and of Robert I, crowned at Paris in 922.

Robert I, King of France, was killed at the Battle of Soissons in the year following his accession, while fighting against the forces of Charles the Simple, who belonged to the rival house of the West Franks.

Robert II, the Pious, king of France, was the great-grandson of Robert I and the son of Hugh Capet, under whom the French Duchy was united with the kingdom of the West Franks and whom he succeeded on the throne in 996. Robert II, by spreading his power over Gaul, did much to establish the modern kingdom of France.

ROBERT. The name of three kings of Scotland.

Robert I, KING OF SCOTLAND (1274-1329). See **BRUCE, ROBERT**.

Robert II, KING OF SCOTLAND (1315-1390). Known as The Steward or Stuart, was the grandson of Robert Bruce (Robert I), and succeeded David II on the throne in 1371. After the capture of David II by the English at Neville's Cross (1346), Robert became regent for the eleven years of the king's captivity. On the release of David by the Treaty of Berwick (1357) and his promise, being childless, to recognize a son of Edward III of England as his successor on the Scottish throne, Robert's hopes of succession faded. To obviate the risk of a *coup d'état*, Robert and his sons were imprisoned by David II, but were released in 1370. The accession of Robert in the following year was the beginning of the

history of the ill-fated Stuart line of kings of Scotland and England. Most of the nineteen years of his reign were occupied with border warfare.

Robert III, KING OF SCOTLAND (1340-1406). Formerly known as John, Earl of Carrick, was the eldest son of Robert II, and succeeded him in 1390. Owing to physical disability, he was unable to take any share in the government of the country and the regency was exercised by his younger brother, the Duke of Albany, chamberlain of Scotland.

ROBERTS OF KANDAHAR AND WATERFORD. **FREDERICK SLEIGH ROBERTS, FIRST EARL (1832-1914).** "Bobs," as he came to be known to the entire British

Army, was born at Cawnpore, India.

After passing through Eton and Sandhurst, he won a commission in the Bengal artillery in 1851. For forty-one years he served with the Indian army, becoming noted for his great military ability and genius in transporting and supplying troops, being Commander-in-Chief from 1885 to 1893. He saw active service in the Mutiny and for gallantry in action at Khudaganj, he received the much-prized Victoria Cross. During his varied and efficient service, he fought on the North-West Frontier and in south-east Bengal, and was senior base staff-officer to the Bengal Brigade in the Abyssinian campaign of 1867. In 1878 he forced the Kurram pass into Afghanistan, and in 1879, on news of the murder of the British envoy, Sir Louis Cavagnari, occupied Kabul. In 1880, from there Roberts performed a remarkable and memorable march to Kandahar. With a force of 10,000 men, he marched 313 miles through hostile territory in twenty-two days, and on the twenty-third day, gained a complete victory over the rebels who besieged Kandahar, though his force was far outnumbered and had suffered terribly on the march. He was officially thanked by Parliament and created a baronet. For his further services while Commander-in-Chief in India, he was raised to the peerage as Baron Roberts of Kandahar and Waterford and promoted to Field-Marshal.

After the opening disasters of the South African War (Boer War), in which Lord

Roberts lost his only son, he was sent to Africa to take supreme command. Arriving at Cape Town in January, 1900, he quickly changed the aspect of affairs. War was carried into the enemy's country, Mafeking and Ladysmith were relieved, and Bloemfontein, Johannesburg, and Pretoria fell into the hands of the British. When, in its final stages, the struggle dwindled to guerrilla warfare, the command was handed over to Lord Kitchener, and Roberts returned to England. There he was awarded an earldom and a grant of £100,000 and was made Commander-in-Chief of the British Army and a Knight of the Garter. He retired in 1905, but devoted much of his leisure to advocating national military training in preparation for threatening European war.

At the outbreak of the World War in August, 1914, Lord Roberts was frequently in consultation with the War Office, and when two Indian divisions arrived in France, he made a trip to that country to visit the men in the trenches. While he was at the front, he contracted pneumonia, and died on 14th November. Lord Roberts was buried in St. Paul's. See SOUTH AFRICAN WAR.

ROBERTSON, SIR WILLIAM (1860-1933) Field-Marshal of the British Army; he was born of a Lincolnshire family. He took up the profession of a soldier at the age of seventeen and served in India (Chitral expedition) and elsewhere before joining the Staff College at Camberley (1897). He was staff captain for intelligence under Lord Roberts in the South African War, and on his return became Assistant-Director of military operations at the War Office (1901-7), and held various important posts at Aldershot.

When the World War broke out, he became Quarter-Master General of the Expeditionary force and soon after, Chief of the Imperial General Staff, in which capacity he served until February 1918, when on the appointment of a Supreme War Council he resigned. He was Commander-in-Chief of the Rhine Army during 1919-20, and was then promoted to the rank of Field-Marshal.

Robertson was a remarkable example of a soldier who rose from obscurity to the



LORD ROBERTS
Photo Brown Bros



FIELD-MARSHAL SIR
WILLIAM ROBERTSON
Photo Central

highest command. He owed his success to his unrelenting energy and his indomitable will. He published in 1921 an autobiography, entitled *From Private to Field-Marshal*.

ROBESPIERRE, *vo bés pyair'*, MAXIMILIEN MARIE ISIDORE (1758-1794). He was born at Arras and educated there at the college. After studying law at the Collège Louis le-Grand at Paris, he returned to Arras to begin a legal career. He speedily became known as a skilful advocate, a man of integrity, and the possessor of a nature so kind that in 1782 he resigned a position as criminal judge rather than pronounce a death sentence. He



ROBESPIERRE
Photo Brown Bros.

was an enthusiastic student of Rousseau, and at the approach of the French Revolution thought he saw an opportunity to establish the ideal society which Rousseau had described. He therefore began to speak for the democratic views then popular among the French middle classes, and when the States-General met at Paris in 1789, he

was sent as a representative. In the Assembly he was regarded as an extremist, but he became the hero of the Jacobin Club and of the Parisian poor. He bitterly opposed the policies of the Girondins. See GIRONDIST.

After the storming of the Tuileries, he was elected a member of the Commune of Paris. At the trial of Louis XVI, on 1st January, 1793, Robespierre stood firmly and successfully for the death sentence. At this time he gained the friendship of the radical revolutionist Danton, just then rising to power.

In July, 1793, Robespierre was elected to the new Committee of Public Safety, and through its work gained ill fame which will doubtless follow him through all history. This committee resolved to crush all dissension at home, so that a united country might face its foreign enemies, and to this end the "Terror," or reign of the guillotine, was established. The accusation that Robespierre incited this period of violence is to some extent unjust. He had but two allies in the committee of twelve, and could not have dictated affairs. Between 10th June and the death of Robespierre, 28th July, 1794, this organization sent to the guillotine nearly 1,300 people.

Meanwhile, even his political allies began to fear his power, and the Committee of

Public Safety decided to make him the scapegoat for the butchery of the Terror. On 26th July he defended himself in such a forceful speech that the Convention voted to follow his suggestion of ceasing the wholesale execution, and placed no blame upon him. The next day, however, his enemies rallied their forces and caused the Convention to declare him "outside the law," meaning, practically, an outlaw. During an attempt to arrest him, part of his jaw was torn away by a bullet, and in this horrible condition he was brought before the Convention. Unable to defend himself, Robespierre was sentenced to the guillotine, and was executed the next day.

Robespierre was a great orator, and to his speeches and his integrity—he was called "The Incorruptible," he owed his great influence over the common people.

ROBIN. A nickname for the Redbreast, though by use it is now the more commonly used name. In other English-speaking countries Robin has been adopted generally for



ROBIN
The nest has been made in an old kettle
Photo John Kearton

certain birds with a characteristically red breast. These birds are otherwise quite unrelated. For example, the American Robin belongs to the thrush family. See REHBREAST.

ROBIN HOOD. A popular hero of English legend. The old ballads describe him as an outlaw, living with his yeomen in Sherwood Forest in Nottinghamshire. It is said he never molested poor travellers, or any company in which a woman was present. On the contrary, he often shared with the

needy the spoils which he took from his wealthier victims.

ROBLES, JOSÉ MARIA GIL. An able Spanish economist, he was appointed Professor of Political Economy at Salamanca University. For many years he has been a member of the Cortes and leader of the *Acción Popular Agraria*. For some years he has inevitably been in opposition, but he has wielded great influence at the head of the C.E.D.A.—the Spanish Confederation of Autonomous Rights. It was his attack that drove out the Samper Government in 1934. When votes began to swing away from the extreme Left in 1935 and Señor Lerroux-García became Premier, he offered the Ministry of War to Robles, who held it until the Left returned to power.

ROBOT, ro' bot. A term used to describe mechanical devices performing the work ordinarily done by man.

Mechanical contrivances have been used for the direction of traffic, and for purposes such as opening doors at a person's approach



ROBOT
Photo Topical

The term is derived from a play by Karel Kapek. In popular usage it is employed also to denote persons whose work is so monotonous as to make them similar to mechanical "robots."

ROB ROY (1671-1734). A Scottish outlaw immortalized by the writing of Scott. Rob Roy was the son of Donald Mac-

gregor of Glengyle. His mother was a Campbell.

Having inherited land in the Highlands, he found it necessary to gather about him a band of armed clansmen to protect his herds from outlaws. His own career of outlawry was the result of unwise speculations, for he was compelled to borrow money from his neighbour, the Duke of Montrose, and when the loan was not repaid, the Duke evicted him from his property and placed him under the ban (1712). In desperation, Rob Roy organized a band of followers against the Duke and his tenants, stealing both their cattle and their rent money. In 1722 he gave himself up to the English authorities. He was imprisoned and sentenced to be transported (1727), but was pardoned and permitted to return to Scotland.

ROC. A huge bird of Arabian mythology, able to carry an elephant in its talons, and said to have dwelt in the vicinity of Madagascar. It is mentioned in the story of Sinbad the Sailor in the *Arabian Nights Entertainments*.

ROCHDALE. A County Borough situated 11 miles north of Manchester, near the Yorkshire border, on the London Midland and Scottish Railway. Population (1931) 95,590.

Rochdale is supremely an industrial town. Besides the outstanding cotton and wool trades, there are flannelette manufacturing, calico-printing, carpet-weaving, leather belt manufacture, and the making of confectionery machinery. The flannel industry dates back to the sixteenth century. Knitted fabrics in wool and silk and artificial silk are also made. Asbest goods are produced in great variety, while wool working and textile machinery making and electrical engineering, are other industries of the town.

Riches found in the district point to ancient settlements long before the Romans reached it. There was later an Anglo-Saxon settlement, and a Saxon castle was built. In succeeding centuries, Rochdale gradually advanced in importance, and in 1350 the woollen trade was introduced. By 1700 the population had grown to 8000. John Wesley visited the town in 1740. From 1800 progress was more rapid, and with the coming of Jacob Bright and the setting up of the Fieldhouse Mills, the woollen trade was for a time at the height of prosperity. Progress (not unmingled with some periods of depression) has continued to the present, and with the recent additions to the variety of its industries, Rochdale has a more balanced industrial structure than other Lancashire towns.

ROCHELLE, ro shel', SALT. See SALTS. SEIDLITZ POWDERS.



EARL OF ROCHESTER
(National Portrait Gallery)

ROCHESTER, JOHN WILMOT, SECOND EARL OF (1647-1680). Poet. In a generation of dissolute poets who brightened the Court of Charles II, Rochester was one of the most notorious. He died a penitent, still a young man, leaving behind him one or two exquisite lyrics, and a poetical *Satire against Mankind*.

ROCHESTER. A city and Municipal Borough of Kent, 33 miles from London on the S.R. It was a walled town under the Romans, owing its importance to a ford over the Medway. The cathedral church of Saint Andrew was founded by Augustine and rebuilt by the Normans. The keep of the castle, built by command of William Rufus, remains. Population (1931) 31,193.

ROCK. The solid portion of the earth's crust. The formation of rocks from molten material is still going on, and may be seen wherever active volcanoes throw out lava, which solidifies on cooling. The rock envelope of the earth contains nearly all the known chemical elements, though only eight of them enter into the composition of rocks in such proportions as to require being named. They are found in approximately the following proportions:—

	PER CENT
Oxygen	46.25
Silicon	28.06
Aluminium	8.16
Iron	4.64
Calcium	3.30
Magnesium	2.62
Sodium	2.61
Potassium	2.32

Silicon is the basis of all quartz rock; alumina (aluminium oxide) is the basis of clay; lime (calcium oxide) of limestone; and magnesia (magnesium oxide) of all the ferro-magnesium minerals.

As used in geology, the term *rock* means any solid portion of the earth. Sand, gravel, and ice are rock to the geologist. The term *stone* is applied to small, detached portions of rock, though very large masses are usually called *rocks*. Rounded stones which have been shaped by the action of ice or water are called *boulders* or *pebbles*, depending upon their size.

According to their formation, rocks are classified as *igneous*, *sedimentary*, or *metamorphic*; according to their composition, as *granite*, *marble*, *quartzite*, *slate*. Rocks may also be classified according to their *cleavage*.

This is the property possessed by some metamorphic rocks and by many crystalline minerals of being divisible in certain directions into layers of thin sheets. The flat surfaces separating the layers are called *cleavage planes*.

True rock cleavage is found only in fine grained metamorphic rocks of rather uniform mineral composition, such as slate and some varieties of schists. It is not a structure that the rocks have possessed since their formation, but was imposed upon them when they were metamorphosed under intense pressure. The metamorphosed rocks are composed largely or wholly of minerals in the form of small flakes, or of small plate-like crystals that lie nearly parallel. Consequently, they can be split into slabs or thin layers with fairly smooth sides, in a direction parallel to the flat crystals. Parallel cleavage is the feature which gives the slates, gneisses and schists their many important uses.

Mineral cleavage, on the other hand, is inherent in the minerals that possess it, it is due to the atomic structure of the crystal and not to any later changes imposed from without. Some minerals, such as mica, are cleavable in only one direction, but others are cleavable in as many as four directions. The number of directions in which a mineral is cleavable is related to the degree of symmetry of its crystallization.

Sandstones and limestones, which split in any direction, are valuable building stones, being easy to dress. See **GEOLOGY**; **IGNEOUS ROCKS**; **PETROLOGY**; **SEDIMENTARY ROCKS**; **STRATIFIED ROCKS**.

ROCK CLIMBING. See **MOUNTAINEERING**.

ROCK CRYSTAL. See **QUARTZ**.

ROCKEFELLER. The name of an American family of financiers. The elder member, John Davison (born 1839), who gained predominant control over the oil industry by his establishment of the Standard Oil

Company, is accounted the richest man in the world. About \$50,000,000 of his

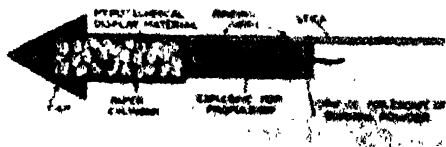


JOHN D. ROCKEFELLER
Photo Brown Bros

vast fortune has been disbursed in charity and endowments. Among other notable works, J. D. Rockefeller has financed the Rockefeller Foundation, which at present is engaged on the control of malaria and yellow fever, and the Rockefeller Institute for Medical Research. These gifts calmed the indignation of the American public which arose when the methods by which his fortune

had been built up were revealed in newspaper campaigns. He retired in 1911, handing over the conduct of his business affairs to his son, John D., jun.

ROCKET. The familiar "skyrocket" is a cardboard cylinder with a pointed head, fastened to a light stick that both balances and guides it. The lower part of the cylinder is filled with a combustible material, usually a specially blended gunpowder. The material which produces the ornamental effect, or the garniture, is contained in a paper tube called *pot*, and is placed in the upper end of the cylinder. The reaction of the gases liberated by combustion is sufficient to project the rocket through the air, and as the rocket reaches its greatest altitude, the garniture is ignited by the flame which spurts through



a hole from the lower section of the cylinder. There are also *winged rockets*, furnished with cardboard wings instead of a stick.

Skyrockets of a very similar type to the firework rocket are occasionally used by ships in distress for sending out S.O.S. signals. Rocket apparatus is frequently of service to vessels aground on dangerous coasts, or where stormy seas make it impossible for a lifeboat to come close up, by enabling a life line or breeches buoy to be thrown on board.

Another important application of the rocket which has met with some success is in the carrying of mails over fairly short distances where other means of communication are difficult, e.g. between certain of the Scottish islands.

For war purposes, rockets are sometimes employed by front-line troops to signal to the rear when communication has been cut off by shell fire; and rockets carried by aeroplanes have been used for attacking observation balloons and airships. These latter are electrically fired.

Rocket Propulsion. An Austrian scientist, Max Valier, and an American astronomer, Professor Goddard, recently conceived the idea of using the rocket principle for human transport, their ideas hold out no small possibilities and have already formed the basis of actual experiments. In 1928 Herr Fritz von Opel designed a rocket car on the lines of Max Valier's ideas. Twelve rockets fixed in steel tubes at the back of the car, fired electrically by an accelerator pedal, enabled a speed of 60 m.p.h. to be reached in 8 seconds and a maximum speed exceeding 100 m.p.h. was obtained on the Avus motor road. Later, on a railway track, the car attained 159 m.p.h. with a cat as passenger. To slow up the car, braking rockets were fired in the opposite direction to the propelling rockets, but owing to the accidental ignition of braking and propelling rockets simultaneously, the car was wrecked. In Germany and elsewhere attempts are being made to perfect a "rocket" aero engine.

ROCKINGHAM, CHARLES WATSON-WENTWORTH, SECOND MARQUESS OF (1730-1782) Twice Prime Minister, he was educated at Westminster School and St. John's College, Cambridge, and entered the royal household as Lord of the Bedchamber to George II and afterwards to George III. He was a staunch Whig and a firm adherent of the House of Hanover, but on account of his opposition to the Bute Ministry in 1762 and to the projected peace with France (Treaty of Paris), he resigned his offices. On the fall of Grenville in 1765, he formed a coalition ministry and found himself faced with a critical situation in America where opposition to Grenville's taxation proposals



SECOND MARQUESS
ROCKINGHAM
(National Portrait Gallery)

was coming to a head. Rockingham was inclined to be accommodating and in 1766 the Stamp Act was repealed. At the same time the Declaratory Act was passed, asserting that the power of taxing rested with the Parliament in Westminster. Rockingham fell from power shortly after, owing to the opposition of Pitt, who formed a non-party government. Rockingham was leader of the opposition until 1782, when he was again called to the direction of affairs, following Lord North. He was anxious to end the American War, but died three months after taking office. His guiding principles in politics were an uncompromising resistance to an extension of the royal prerogative, and a hatred of corruption.

ROCKINGHAM FOREST. See **NORTH-ANTS.**

ROCKY MOUNTAINS. The eastern half of the western Cordilleras of North America. Actually the range begins near Vera Cruz in Mexico, passes north and west and ends in Yukon, Canada, at about 63° N., the loftier St. Elias Alps (Mt. Logan 19,850 ft.) and Alaskan Range (Mt. McKinley 20,460 ft.) being, strictly speaking, separate systems. At their southern end, the Rocky Mountains touch the eastern coast of the continent, their steep slopes rising almost directly out of the Gulf of Mexico.

In the United States. To the south of the Laramie Plains, a plateau 7000 ft. above sea level, is the highest and broadest section, covering Colorado and Eastern Utah, then come the lower and less compact ranges of New Mexico and Texas. In Colorado alone there are almost forty peaks over 14,000 ft. high; in Utah and New Mexico, ten exceed 13,000 ft. Above the Laramie Plains the Rockies extend toward the north-west, and are narrower and slightly lower. Wyoming

has half a dozen peaks more than 13,000 ft. high, but Idaho and Montana have each only one summit above 12,000 ft. Traces of volcanic activity are found in the lava beds of Montana and Idaho and in the geysers of Yellowstone National Park. The highest peak in the United States Rockies is Mt. Harvard in Colorado, 14,375 ft.

The Canadian Rockies. There are dozens of peaks more than 11,000 ft. high and several more than 12,000, one, Mount Robson,



TRAVEL IN THE ROCKY MOUNTAINS

Photo Cherry Kearlton

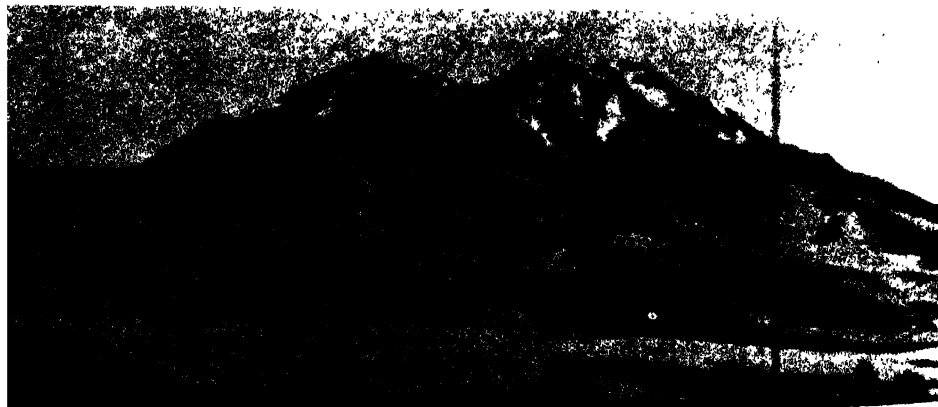
reaching 12,972 ft. The principal peaks of the Canadian Rockies are in British Columbia and toward the north the range gradually decreases in height. Recent exploration has shown that the Canadian Rockies die away north of the Liard River in a plateau, across which, 150 miles to the north, the Mackenzie Mts. spring up and continue to the Arctic coast. Some of the finest scenery is included in national parks, e.g. Jasper Park.

The principal minerals found in the Rockies are gold, silver, copper and coal.

ROD. See **WEIGHTS AND MEASURES.**

RODENTS, OR RODENTIA, *roden'ti-ah*.

An order of mammals whose distinguishing characteristic is the possession of teeth



TYPICAL PEAKS OF THE ROCKY MOUNTAINS IN MONTANA

The loftiest is Emigrant Peak.



AFRICAN ROCK RABBITS
Photo: Cherry Kearton

especially adapted for gnawing. These are large, curved, deeply-rooted front teeth. There is always one pair in the lower jaws and generally one pair in the upper jaw, though occasionally, as in rabbits, there are two pairs. These teeth are peculiar in that they grow continuously from the roots, but wear away at the tips; as the front surfaces alone are protected by enamel, the teeth wear faster at the back, and so a sharp, chisel-like edge is developed. For this reason, these animals can gnaw through very hard substances. Canine teeth are totally absent.

Rodents are generally small, but show considerable variation in size, the smallest rodent is the mouse, and the largest the capybara, a South American aquatic animal that grows to be 4 ft. long. In habits there is even greater variety, for some live in burrows, some have nests in the woodlands and meadows, some live in trees, and the muskrats and beavers can live in water.

RODEO, *ro day' o*. A word of Spanish American origin, meaning "round up," used to denote a sport and entertainment, generally held annually in various towns of the western states of America. The original and best-known rodeos are those of Cheyenne and Denver. Prizes and awards of cash are offered to those who show the greatest skill in the contests. Regular contests include riding a bucking horse and throwing a steer, or "bull-dogging," as this is more commonly known. A similar form of entertainment has been given in London and, with varying degrees of success, in other parts of the world.

RODERICK OF CONNAUGHT, High King OF IRELAND (died 1198). Roderick or Ruaidri, son of Turlough O'Connor, King

of Connaught, succeeded his father in 1156. Turlough had formerly been Ard-Righ or High King, a position Roderick won back after ten years of war. He drove out Dermot Macmurrough, King of Leinster, who appealed to Henry II of England. Roderick fought the Anglo-Norman raiders till 1175, when by a treaty at Windsor he agreed to do homage and to pay tribute to Henry for his kingdom, retaining his overlordship over all Irish kings. In 1191, after further wars with the Normans, he became a monk.

RODIN, *ro' daN*, AUGUSTE (1840-1917). French sculptor. His theory that nature should be the artist's one source of inspiration, and that only those creations which possess no character are ugly in art, was consistently applied throughout his career. Rodin was born in Paris. His genius was apparent early, as one of his finest pieces, a head entitled "Broken Nose," was modelled when he was only 24.

Rodin's famous "Age of Bronze," which created a sensation because of its daring realism, was exhibited in 1877 in the Paris Salon. Then followed a bust of St John, "St John Preaching," "The Thinker" (his best-known work of sculpture), "Adam and Eve," the monument to the six "Burghers of Calais," "The Kiss," the "Danau," the "Bather,"



RODIN
Photo: Brown Bros

and many other works, including busts of several noted men.

RODNEY, GEORGE BRYDGES, BARON (1719-1792). A British Admiral; educated at Harrow School, he entered the Navy at the age of thirteen. He first saw important



ADMIRAL LORD RODNEY
(National Portrait Gallery)

active service under Admiral Hawke against the French off Rochelle, in the War of the Austrian Succession (see SUCCESSION WARS). On the conclusion of peace he went to Newfoundland as Governor (1748-52). During the Seven Years War (1756-63) Rodney, now rear-admiral, block-

aded the port of Havre and destroyed the flotilla which was being equipped for a descent upon the English coast. In 1761 he was put in command of the naval force in the West Indies (Leeward Islands station), which took possession of the French islands of Martinique, Santa Lucia, Grenada and St. Vincent. For some years (1765-70) after the Peace of Paris, he was governor of Greenwich Hospital. In 1778 he became admiral and was again put in command of the Leeward Islands station. He had a prominent share in the victorious Battle of St. Vincent against the Spanish in 1780. For his victory over the combined French and Spanish fleets off Dominica two years later, whereby British supremacy at sea was restored after a temporary lapse, Rodney was rewarded with the thanks of Parliament, a peerage and a pension of £2000 a year.

RODRIGUES, rô dre' gey. A dependency of the British colony of Mauritius, situated about 230 miles to the north-east of that island; area, 42 sq. miles, population, 9111 (1934), chiefly negroes. It is mountainous, volcanic and fringed with coral reefs. With a warm, wet climate the island is fertile and grows maize and fruits. Cattle rearing is notable and fishing is much pursued. Administration is by a resident magistrate. Rodrigues was discovered by a Portuguese early in the sixteenth century, occupied by the French in the eighteenth century, and seized by the British in 1809. See MAURITIUS.

ROE, rô, also called **ROE DEER**, and male **ROEBUCK**. A European member of the deer family, one of the smallest of that race. It is a graceful, agile animal, with a long neck, slender legs, and a very short tail. Its summer coat is fox-red above and white

beneath, but in winter this changes to a greyish-fawn colour, with a white mark on the rump. The male is about 27 in. high at the shoulder, and has upright antlers with two main forks. Roe deer are still found wild in sparsely populated regions in temperate parts of Europe, but are far less abundant than formerly.

Scientific Name. The roe belongs to the family *Cervidae*. Its scientific name is *Capreolus capreolus*, (or *caprea*).

ROENTGEN, runt' gen, RAYS, OR X-RAYS. Waves of radiant energy that have the power of penetrating substances opaque to ordinary light waves. The name *Roentgen*



AN X RAY PHOTOGRAPH SHOWING A BROKEN BONE

was given these "rays" in honour of their discoverer (see below). Roentgen himself called them *X-rays* because he did not understand their mechanism. He discovered them while experimenting with Crookes tubes, an early form of vacuum tube in which cathode rays are generated.

X-rays are very short electric and magnetic waves produced by the impact of electrons, or cathode rays, on a heavy block of metal, called the *target*. They are generated in various types of glass bulbs.

X-rays are practically of the same nature as light rays, except that they have much shorter wave-lengths. In the general spectrum, they lie beyond the ultra-violet rays, but overlap them. The most penetrating X-rays, the high-frequency "hard" rays, can readily pierce wood and even enter a short distance into lead.

There are but two forms of electromagnetic radiations having greater penetrating power than the hardest X-rays. These are the *gamma rays* emitted by radioactive substances, which can penetrate twenty centimetres, or nearly 8 in., of lead, and *cosmic rays*, generated in space, which are capable of penetrating 18 ft. of the solid metal. They are sometimes called *super* and *ultra X-rays*. Gamma rays have shorter wave-lengths than X-rays, and cosmic rays have still shorter ones, the average length of the latter being five million-millionths of a centimetre. See COSMIC RAYS.

Uses of X-rays. The most valuable uses of these radiations are found in the field of surgery and medicine. The rays penetrate such substances as flesh, clothing, and plaster of Paris, but are partially stopped by bone, metals, pus, and dense tissue. The shadow pictures taken by the X-ray apparatus reveal bone fractures, diseased joints, body tumours, and other growths, diseased conditions of the intestinal tract, incipient tuberculosis of the lungs, stones of the kidney and gall bladder, abscesses of the teeth, and many other pathological conditions. Thus X-rays are invaluable in the diagnosis of disease and in the location of injuries. During the World War, they proved their worth in the detection of bullets and shell fragments and were an indispensable aid to the surgeon. Their curative effects are best revealed in the treatment of skin affections and nervous diseases.

In industry, X-rays are used to reveal defects in materials, to prove the quality of welding in aeroplanes and other machines, and to test timber, and they are of practical assistance in rubber-making, in the manufacture of optical glass, and in electrical engineering, etc.

Wilhelm Konrad Roentgen (1845-1923), the discoverer of X-rays, was born at Lennep, Prussia. After intensive study at the University of Zurich, he became professor at Hohenheim, Strassburg, and Giessen, and in 1885 was appointed to the chair of physics at Würzburg. Here, in 1895, he announced his discovery of the new form of radiation. For this achievement he was given the Order of the Royal Crown by the German Emperor, and the title of baron by Prince Ludwig of Bavaria. He was also awarded the Rumford Medal of the Royal Society of London, and

in 1901 the Nobel prize in physics. See CATHODE RAYS; RADIOACTIVITY; ULTRA-VIOLET RAYS.

ROESTONE. See OOLITE.

ROGATION, ro gay' sh'n, DAYS. In the Roman Catholic Church, the Monday, Tuesday, and Wednesday before Ascension Day. On these days, prayers known as the *litanies* are appointed to be sung or recited by the priests and people, often in public procession. The week in which the days occur is sometimes called *Rogation Week*. The name comes from the Latin *rogare*, meaning "to ask," and the Greek *litaneia* has a similar meaning. See LITANY.

ROLLE, RICHARD, OF HAMPOLE (1300-1349). Hermit and religious mystic, he was born at Thornton, near Pickering, in Yorkshire. After leaving Oxford he lived at Thornton and at various other places, including Hampole, near Doncaster (where he died), as a hermit of the woods. He devoted much of his time and energy to writing, in Latin and the Northumbrian dialect, sundry meditations and prayers, commentaries on the scriptures and translations or paraphrases of parts of the Bible, including the Psalms and Canticles. His best-known writing is a poem, *The Pricke of Conscience*.

He exercised a great influence on the religious life of his age. He died in the year of the Black Death.

ROLLER. A common name for the species of a genus of birds which have a characteristic habit of tumbling in their flight. Rollers are about the size of large thrushes or crows and very brightly coloured. Most species are found in Africa and India. One species breeds quite far north in Europe and Asia. This bird, though it does not breed in the British Isles, is almost invariably seen in several places throughout the country every summer.

Scientific Name. The rollers belong to the family *Coraciidae*. The species seen in Britain is *Coracias garrulus*.

ROLLS, MASTER OF THE. The office of Master of the Rolls dates back at least to Plantagenet times. The Master of the Rolls was originally the chief clerk of the King's Chancery, and was so called because he had charge of the State "rolls" or records. When the Chancery developed into a Court of Justice, the Master of the Rolls gradually assumed the position of an assistant judge, until in 1729 an Act of Parliament gave him an independent status as a judge of the Court of Chancery. On the reorganization of the Courts in 1873 the Master of the Rolls became a judge of the Court of Appeal, of which he is normally the acting president. He has the superintendence of the Public Record Office.

ROLL SULPHUR. See BRIMSTONE.

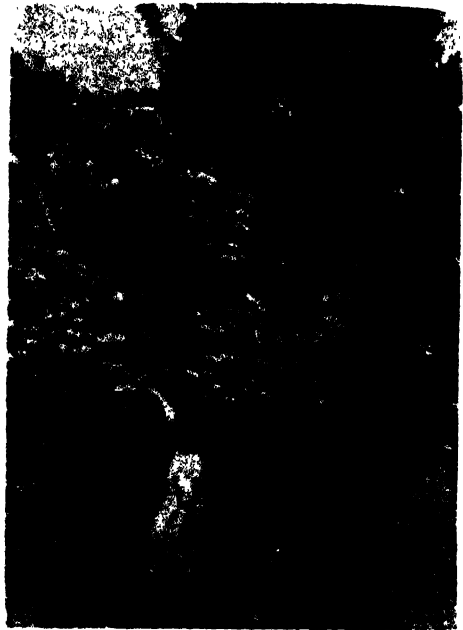
ROMAIC, *ro may' ik*. The modern vernacular language of Greece, derived from that popularly spoken in the Eastern Roman Empire.

ROMAN ARCHITECTURE. See ARCHITECTURE.

ROMAN BRITAIN. The occupation of Ancient Britain by Rome is often inaccurately referred to as a conquest. In the sense of an economic ascendancy this term may be allowed, but Britain was never conquered and held by force of arms as an integral part of the Roman Empire. Long before Caesar first landed in Britain it had come under the influence of Rome through trade with Gaul, which was a Roman province. What was effected was an increase in this Romanization and the collection of revenues both directly through taxation, and indirectly through trade from a country which was the last outpost of Roman civilization. Within certain limits, the position of Britain in the Roman Empire approximated to that of a Crown colony in the British Commonwealth of Nations. Only a few colonists were introduced into the country by a government whose policy was rather to Romanize the existing inhabitants until it became an honour to be a Roman citizen.

The advanced civilization which grew up was Romano-British rather than Roman, just as styles of architecture and of art which formed part of the civilization were Roman in origin but British in tradition. The legionaries stationed in Britain were far more important in their function of defending the Saxon shore from the incur-

sion of Picts in the North, and of Saxons and Norsemen from across the North Sea, than



ROMAN CITY WALLS AT SILCHESTER, HAMPSHIRE

Photo. George Long

in their more obvious duties of retaining in subjugation a nation which, once the idea of Roman citizenship had become part of



ROMAN MILESTONE

Still in its original position by Hadrian's Wall.

Frith

the national morale, had no wish to revolt. It was with the greatest regret that the inhabitants of Britain watched the Roman legionaries depart, recalled to preserve the tottering empire from the inroads of barbarians nearer home. Considered criticism of later ages has confirmed the contemporary opinion that their withdrawal was one of the major tragedies which have ever befallen the British Isles. For with their departure security was lost and civilized Britain was defenceless against the Saxon invaders.

The first landing of Julius Caesar took place in 55 B.C. It was succeeded by a second in 54 B.C., but neither was in the nature of an expedition of conquest, although Roman writers apparently looked on the Britons as dependants of Rome from that time. It is significant, too, that Roman coins have been found dating from a time approximating to the invasion of Caesar. It was not until A.D. 43 that the Emperor Claudius landed on the coast of Kent at the

head of a considerable army and made such good progress that within three years the greater part of Southern England had been overrun and was administered by Rome through native chieftains. Northern England and Wales had not been garrisoned until A.D. 80. Meanwhile the abortive rising of Boadicea had given pause to the development of Southern England. The Roman general, Agricola, of whom more is known through the historian Tacitus than of any other of the succession of generals who administered Britain, completed the nominal conquest as far north as a line drawn between the Clyde and the Forth. The Emperor

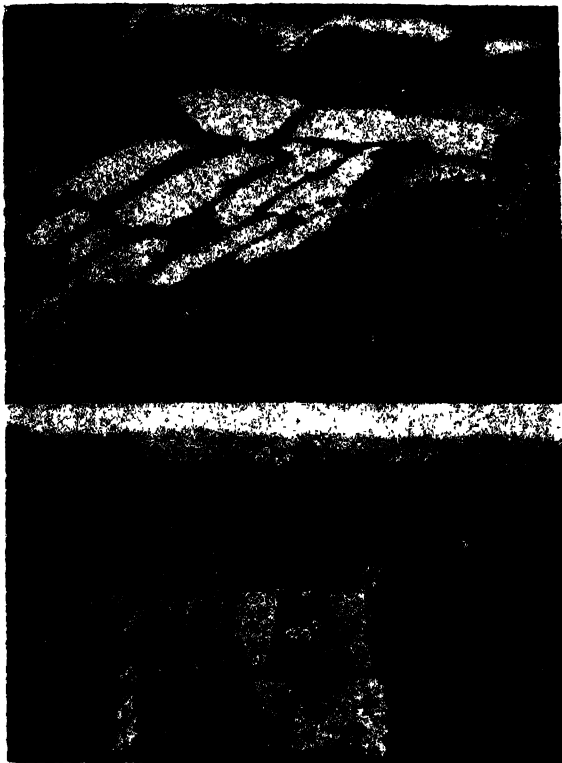
Hadrian, the second emperor to land in Britain, withdrew the line of fortifications to the line of the wall which bears his name, extending from the Solway Firth to the estuary of the Tyne. Later the boundaries were again extended to the Forth-Clyde, where a second wall was built which bears the name of the then Emperor, Antoninus Pius.

The Roman influence never extended farther north than this wall, and by the third century had again been withdrawn to the wall of Hadrian. There is little to recall in the military history of the next two hundred years, which were a period of comparative peace and prosperity during which the Romans accepted the inaccessibility of Scotland, and the Britons, for their part, accepted Roman suzerainty implicitly.

Towards the beginning of the fourth century a line of forts was built to defend the southern and eastern coasts, of these Richborough Castle in Kent, Portchester in Hampshire, and Burgh

Castle near Yarmouth are examples. The end came a hundred years later, when the province of Gaul was wrested from Rome by Saxon invaders, so that touch was lost with the central government. Previous to that most of the legionaries had been withdrawn.

The Organization of Roman Britain. Britain was organized as a province in much the same way as was Gaul. Nominally it was subject to a governor who, however, had little greater influence over the government than has the Governor-General of the British dominions overseas to-day. At a later period Britain was divided into two provinces, and, later still, into a larger



ROMAN ROAD AND AMPHITHEATRE
The roadway over Blackstone Edge (above) and the amphitheatre at Caerleon.
Photos: Lancashire Industrial Development Council, Taylor

number, but this was not until after the province had passed its heyday. Three legions only were stationed in the country—one at York, one at Chester and one at Caerleon. In addition, there were a number

although, in a few cases, nominees were sent from Rome. In addition, there were a number of towns known as *municipia*, which were self-governing, and governed, in addition, a part of the surrounding



ROMAN VILLAS IN BRITAIN; AND OTHER REMAINS

1. Mosaic floor in the villa at Chedworth; below, the heating arrangements can be seen. 2. Roman brooches, dating from the second to the fourth century, found in Britain. 3. Roman villa at Bignor, Sussex. 4. Glass cinerary urns to hold the ashes of the dead. 5. Remains of the villa at Chedworth

Photos: George Long, British Museum

of bands of auxiliary troops who occupied the smaller forts.

Under the governor the country was organized into a number of practically self-governing divisions, each ruled by its prince who was generally of Romano-British origin,

countryside. The only municipalities colonized by Rome were Colchester, founded on the site of the British capital city by retired Roman legionaries, and, at a much later date, Lincoln and Gloucester. Lincoln was the only one with the distinction of the



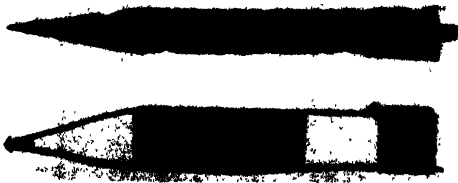
RELICS OF THE ROMAN OCCUPATION OF BRITAIN

(Left) The Loudon Stone, a Roman milestone preserved at Cannon Street. (Centre) Roman pillars with capitals used as gate posts at Wroxeter village church, Shropshire. (Right) Roman altars preserved at Lady St. Mary Church, Wareham, Dorset.

Photos: George Long

Roman title of *colonia*. The other municipalities were York and St. Albans. There is evidence that the Mendip Hills with their rich lead mines formed one of the imperial domains ruled by a Roman nominee. The remaining divisions or cantons seem to have corresponded roughly with the earlier tribal divisions and were ruled in each case from the chief town in the division.

The establishment of villas was a feature of Romano-British life. These were estates of varying size in which prosperous citizens



IRON SWORD AND BRONZE-PLATED SCABBARD
RECOVERED FROM THE THAMES

Photo: British Museum

carried on their business as traders or farmers and housed their complete retinue of slaves and assistants.

It has been possible to reconstruct much of Romano-British civic life from excavations made on the sites of several towns, of which Silchester and St. Albans are the most outstanding examples. The town was surrounded by a moat and an earthwork—remnants of the civilization which preceded the Roman—in addition to the Roman wall, roughly square or rectangular in shape. The towns were divided by two main roads comprehending a chessboard like pattern of squares. The forum, or central meeting-

place, was after the style of the Roman forum. The basilica stood nearby, corresponding to the later market. In most towns there appear to have been elaborate bathing establishments, and at least one inn. Pagan temples and Christian churches both existed.

Apart from the development of civic life, Rome introduced to Britain the fine arts, particularly architecture, and a system of roads, facilitating commerce within and outside the country, which formed the basis of all later communication. Lastly, by the introduction of Christianity they advanced to a stage of civilization which was not approached again until after several centuries of bloodshed and paganism.

Roman Remains. Roman remains, both military and civil, are considerable. Hadrian's Wall is the most spectacular and has been preserved almost intact in many parts of Northumberland. The course of several of the great Roman roads has been perpetuated in modern highways. A signal example of this is Watling Street, from Dover to Canterbury, Rochester and London, and northward from London to Chester. The Fosse Way connected Lincoln with Bath and Exeter. Ermine Street ran from London to Lincoln and York, and another important road served much of Southern England by way of London, Colchester and Bath. There were, in addition, a large number of minor roads, the courses of many of which are still known, whilst on Blackstone Edge in Yorkshire the original Roman paving has been laid bare.

Along the course of these roads greater or less survives of the Roman towns, particularly in the case of mural defences. Rochester, Canterbury, Lincoln, Chester and York



PORT ON THE ROMAN WALL
Photo: Ronald Burt

all exhibit traces of Roman work. The Roman baths at Bath are unique, and the plan of the Roman town uncovered at Silchester is also very complete.

The most important villas are those of Chedworth in Gloucestershire and Bignor in Sussex, where there are large fragments of tessellated pavement, ornamented with artistic designs, and the hypocaust method of heating air for the baths is well demonstrated. The Roman walls of Wareham are

practically intact, and the main streets there are probably the same as those of the Roman town. In the same district the Roman amphitheatre near Dorchester is one of the great open air theatres constructed for gladiatorial and other contests.

Ruins of several of the forts built to preserve the Saxon shore at a later period remained, notably in the case of Richborough and Portchester. The lighthouse by Dover Castle is the oldest building in the country still intact. It is the first lighthouse in this country and analogous



IMPERIAL STATUETTE
Found near Barking Hall,
Suffolk, it is identified as
Nero

Photo: British Museum

to the other Roman lighthouse at Alexandria. In addition, large quantities of Samian ware—the typical Roman pottery—have been unearthed as well as large amounts of coin.

ROMAN CATHOLIC CHURCH. The most numerous and widespread of all Christian

bodies, acknowledging as its visible head the Bishop of Rome, the Pope (see POPES). Catholics maintain that the Roman Catholic Church alone represents the visible religious society, or Church, which Christ himself founded and that the Pope, as Bishop of Rome, is the successor of Saint Peter, whom Christ appointed to be the head of that Church (Matt. xvi. 18-19; John xxi. 15-17). The Pope thus by divine right claims supreme jurisdiction over the whole Church in matters pertaining to faith and morals. Hence the constitution of the Catholic Church is monarchical, and no authority whatever is exercised in the Church by anyone save in dependence upon the authority of the Sovereign Pontiff. The administration of the central government of the Church in Rome is in the hands of the Pope, assisted by his counsellors, the senate or College of Cardinals (which see), who are in charge of one or other of the Roman Congregations (or departmental offices) which constitute the Roman Curia. As the Pope is the successor of Saint Peter, so the bishops, by divine institution, are the successors of the apostles. The bishops, subject to the Pope and freely appointed by him, exercise ordinary jurisdiction within the limits of their diocese and considered as a collegiate body under the presidency of their head, the Sovereign Pontiff, have also jurisdiction over the whole Church. Normally the title of Patriarch or Primate is one of honour or of precedence only, and carries no special jurisdiction.

Immediately subject to the bishops, in their turn are the priests and the faithful of each diocese. To be distinguished from the power of jurisdiction or authority, is the power of order conferred by the sacrament of Holy Orders. The hierarchy of order comprises the following (in ascending degrees): door-keeper, reader, exorcist, deacon (Minor orders); subdiaconate, diaconate, priesthood (Major orders) and the episcopate, the "fulness" of the priesthood.

The great majority of Catholics belong to the Roman rite, but those of the Eastern communions who recognize the supreme jurisdiction of the Pope (known as Uniate Churches) are allowed and even encouraged to follow their own rite and local customs. Variants of rite (e.g. the Ambrosian or Milanese, and the Mozarabic in Spain) are found also in the Western Catholic Church. According to the Catholic conception, the Christian religion comprises a body of dogmatic and ethical truth which has been supernaturally revealed by God through his Son, Jesus Christ. The chief doctrines in which the Catholic Church differs from the teaching of Protestant bodies are set forth in the decrees of the Council of Trent.

For some three centuries after the Reformation (which see) the Roman Catholics remaining in this country were deprived of their normal ecclesiastical organization, and were in addition subject to many civil disabilities, their priests even to the death-penalty. The ecclesiastical organization, after periods of government first by an archpriest and subsequently by Vicars Apostolic (at first one, then two, finally increased to eight in 1840), was fully restored in 1850 when the Metropolitan Archbishopric of Westminster, with Cardinal Wiseman as first Archbishop, and twelve suffragan sees were erected in England and Wales. The hierarchy of England and Wales now comprises the four provinces of Westminster, Cardiff, Liverpool, and Birmingham, with altogether eighteen dioceses. The Catholic hierarchy of Scotland, comprising six dioceses, was restored in 1878.

The process of removing the disabilities under which Catholics laboured was begun by the Relief Act of 1791, continued in the Emancipation Act of 1829, and to-day is almost complete.

ROMANCE. The generic name applied to any story, told in verse or in prose, which lays stress upon heroic or unusual happenings. Originally, the term meant any composition in one of the Romance languages (which see), but since tales of adventure, in the early periods of the modern era, were the most popular writings in those languages, the name gradually narrowed to

its present significance. These languages were by no means the first in which such narratives were written, for the ancient Greeks delighted in stories of adventure. Of these the earliest is the *Odyssey*.

During the medieval period, the romances which were so popular in Europe were in verse, adapted to recital by minstrels. In the days of chivalry, love became one of the main motives for the action.

Gradually prose began to take the place of poetry in the making of romance. The cycle relating to Arthur, for instance, came into England in prose form in Malory's *Morte d'Arthur*. In the case of the Spanish Cid and the French Roland, however, verse always remained the classic form of narrative. By gradual growth the romance led to the novel, but some of the greatest novelists have been, in the main, writers of romances, rather than of the type of story more correctly called novel. Thus, Scott's works stand as among the greatest of historical romances.

ROMANCE LANGUAGES. Those languages of the world which have a common origin in Latin, such as French, Italian, Spanish, and Portuguese.

Whenever Rome conquered a people, colonists were sent to Romanize the province; they naturally took their language with them. This was not literary Latin, but what is called *vulgar Latin*, meaning simply the everyday speech of ordinary people, such



ST. PETER'S, ROME: THE PIAZZA, CHURCH AND COLONNADE
The Vatican buildings on the right are the administrative centre of the Roman Catholic Church.
27—C.22367

as soldiers, tradesmen and farmers. Modified by the original language of the conquered country and changed by the usage of uneducated people and the variations of time, the Latin of each country developed into a separate, characteristic language. Hence the differentiation of languages based on the same original.

In addition to those already mentioned, the Romance group includes Provençal, or Early French, which was the language of the troubadours who sang their ballads and romances during the Middle Ages; modern Rumanian; Catalanian; and Ladino, or Romansch. The last is a general name for the dialects in certain parts of Switzerland and the Tyrol, and in the region north of the Adriatic Sea. See FRENCH LANGUAGE, ITALIAN LANGUAGE; PROVENÇAL LANGUAGE.

ROMANESQUE ARCHITECTURE. See ARCHITECTURE.

ROMANI, rom' a ne. The name by which the gypsies call themselves. See GIPSY.

ROMAN LAW. The history of Roman Law may be roughly divided into four periods. (1) From the foundation of Rome (traditional date, 753 B.C.) to the second century B.C. In this period the law was practically confined to citizens (*ius civile*) and was archaic, clumsy and formal; there was, however, a considerable amount of development, partly through statute (*lex*) but more through the ingenuity of the lawyers in adapting old forms to new needs. (2) From the second century B.C. to the beginning of the second century A.D. The conquest of new territories and the growth of trade and civilization made necessary a great development of the law, and a new system of procedure gave a wide power of altering old remedies and inventing new ones to the magistrate in charge of a case (usually, in cases between citizens, the City Praetor). The most important source of new law in this period, or, at least, in its earlier part, is therefore the Praetorian Edict. The Praetor was not the only source of new law in this period; statutes passed by the people (*leges*) continue until the end of the Republic, and, in the Empire, decrees of the Senate (*Senatus Consulta*), opinions of authorized jurists, and rulings of the Emperor came to be regarded as sources of law. In this period we find a new form of marriage, by which the wife did not pass into subjection to her husband; freedom of divorce; the beginning of relaxations in the father's *patria potestas* over his children; and the beginnings of a system of inheritance based on simple blood-relationship. In the law of property and contract we find certain equitable modifications of the strict doctrines of the old law, and also the recogni-

tion of such contracts as loan, pledge, sale, hire and partnership as binding, though not clothed in any special technical forms. The simple and universal principles of law which now become prominent are sometimes collectively called *ius gentium*, in contrast to the strict and technical rules of the older *ius civile*. (3) Second and third centuries A.D. This is the classical period of Roman jurisprudence. Praetorian development ceased after the Edict was consolidated in a permanent form under Hadrian (A.D. 117-138), but the principles of the law were worked out and rationalized by writers who rank among the greatest lawyers of all time. Many of them were prominent statesmen as well as lawyers, for example, Papinian (executed by Caracalla in A.D. 212), Paul and Ulpian (died A.D. 228). We may also mention Gaius (circa A.D. 160) who was probably not a practising lawyer but a teacher of law, and whose *Institutes* is one of the best elementary legal textbooks ever written. (4) Fourth to sixth centuries A.D. This was an age of despotism, in which the only source of new law was direct legislation by the Emperors. Many compilations, both of statutes and of juristic writings of earlier times, were, however, made and some of these were enacted as law. The greatest was the *Corpus Iuris Civilis* of the Emperor Justinian (A.D. 527-565), consisting of the *Digest* or *Pandects* (a collection of extracts from juristic writings, edited to bring them up to date—it is from this that we gain most of our knowledge of the works of the great classical lawyers), the *Code* or *Code of Justinian* (a collection of statutes), the *Institutes* (an elementary textbook); and the *Novels* (the new statutes passed by Justinian after the publication of the Code).

Roman Law after Justinian. In the eastern half of the Roman Empire, Justinian's *Corpus*, or later abridgments of it, remained in force till the capture of Constantinople by the Turks (A.D. 1453), and in Greece until the nineteenth century. The countries of the western half, which had been overrun by the barbarians, at first followed systems in which barbarian customs were mingled with half-forgotten Roman Law. From the twelfth century, however, there was a revival of interest in the genuine Roman Law. The *Corpus* was taught in the universities of Italy, especially in Bologna, and the new learning spread to other countries, where in many cases the Roman law, as interpreted by the contemporary Glossators and Commentators, was actually adopted as the law of the land (*Reception of Roman Law*). Thus parts at least of the law of such countries as Italy, France (and hence of Quebec), Germany, Holland (and hence of

South Africa), and Scotland came to be based on Roman Law. Most of the European countries adopted national codes in the nineteenth century, but the influence of the Roman principles can still be seen in these. England, where the Common Law was firmly established, was little influenced by Roman Law, and the English Common Law was carried to America. Roman Law had, however, a considerable influence on the Canon Law of the Catholic Church, and hence on English ecclesiastical law; and it has influenced many of the doctrines of International Law.

ROMAN LITERATURE. See LATIN LITERATURE.

ROMAN NUMERALS. The number symbols of the Latin language, which are used to-day for numbering clock faces, for marking books, particularly the pages of prefaces, the chapters, and the volumes of a series, for inscriptions on monuments, etc.

The Roman system of counting is by tens. Primarily it is not a letter system, although it is now written with the capital letters of the Latin alphabet. Most of the earlier symbols were derived from the Etruscans.

1	5	10	50	100	500	1,000
I	V	X	L	C	D	M

ROMAN NUMERALS

The symbol *I* was not the capital *I*, but was merely the most obvious mark for *one*, a vertical stroke. The symbols for two and three, *II* and *III*, are equally obvious. The origin of *X* (ten) was probably a crossed *I*. *C* (100) and *M* (1000) stand for *centum* and *mille*, the Latin words for *one hundred* and *one thousand*, but in the beginning they too were expressed by Etruscan symbols which scarcely resembled the letters now used. These symbols may sometimes be found in the earliest printed books. The other signs are *V* (five), *L* (fifty), and *D* (500). There is no zero.

Numbers are written from left to right. 2500 is written *MMD*, and 3550 is written *MMDL*. But to express 3768 we must write *MMDCCLXVIII*. Subtraction by changing the position of the symbols is used for brevity. Instead of writing *IIII*, the *I* is placed before *V*, and we have *IV*. Nine is written *IX*; forty is written *XL*; nineteen hundred is written simply *MCM*.

ROMANOFF, *ro' man of*, more properly ROMANOFF-HOLSTEIN. The name of the family that ruled Russia from 1613 to 1917.

At the beginning of 1613, the country, more than half barbarous, was leaderless; the nobles chose Michael Feodorovitch Romanoff, of the royal house of Rurik, to

rule them, and called him *Tsar*. Nineteen Romanoffs in succession controlled the destinies of the country; in reality, a twentieth was ruler for a few hours, but his tenure cannot well be included.

Peter the Great is usually considered the most able of the Romanoffs; he found Russia medieval and almost wholly unorganized, and he left it a strong nation. Catherine the Great, profane, immoral, witty, but a great constructive leader, made her country respected in the courts of the world. For the most part, the other Tsars achieved no great success. They were autocrats, who based their power on force of arms. Nicholas I (1796-1855), in his thirty-year reign, displayed considerable harshness in suppressing opposition at home and fought ruthless wars against Poland and Persia, though with less success in the Crimea (1853-6). It was not until the twentieth century that a legislative body was tolerated. For Nicholas II, last of the line, see separate article.

ROMANS, *EPISTLE TO THE*. The most important of the letters written by Saint Paul the Apostle. In this he states fully his doctrinal beliefs. The epistle was written in the house of Gaius at Corinth (A. D. 57-59), while he was on his third missionary journey.

ROMANSCH. See LADINO, SWITZERLAND; ROMANCE LANGUAGES.

ROMANTICISM, *ro man' ti siz'm*. A movement in art and literature beginning at the close of the eighteenth century, marked by a revolt against the forms and rigid limitations of the classical period, striving towards a freer and more subjective interpretation of artistic themes, and laying greater stress on originality and content than on form and proportion. Wordsworth, Scott, Shelley, Goethe, Heine, Schiller, Chateaubriand, Victor Hugo and Gautier are among the great Romantics.

ROME. The capital city of Italy. It is situated in the Province of Rome, about 14 miles from the mouth of the Tiber, and is built mainly on a group of seven hills, whence came its ancient name - the City of the Seven Hills (the Palatine, Capitoline, Quirinal, Caelian, Aventine, Esquiline and Viminal). The foundation of Rome, its origin and early development, are lost in an obscurity which is only relieved by the doubtful light of legend.

Ancient Rome: The Monarchy. From 753 to 510 B. C. the city was governed by kings who enjoyed unlimited power. By the time of the fall of the monarchy, Rome had become the first city and the president of the Latin League. A constitution was elaborated by which the king ruled with the help of a senate, consisting of the leading citizens nominated by the king, and the people



THE PETERHOF, PALACE OF THE ROMANOFFS

Once the principal domicile of the Tsars of Russia, it is now used as a museum. The building is 16 miles from Leningrad and overlooks the Gulf of Finland.

(*populus*), to whom the king referred only on important occasions. The senate was selected from a limited number of ruling families (*patricii*). By the end of the period a new class had arisen—that of the plebeians, who consisted of manumitted slaves, immigrants and all those who were not included in the patrician class. The ranks of the plebeians were later swelled by the citizens of conquered towns in Latium.

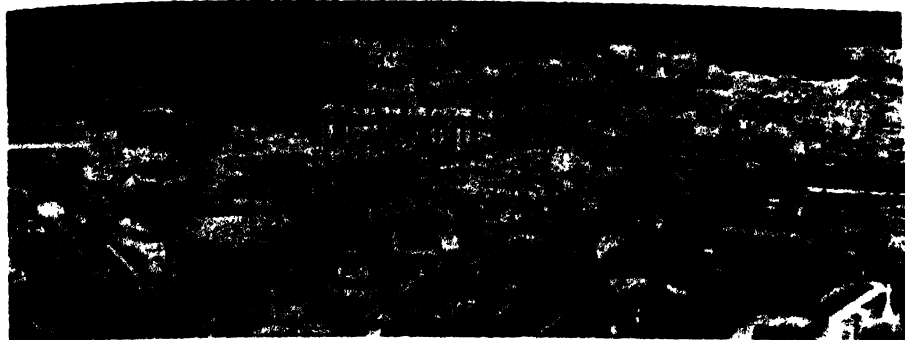
To Numa Pompilius, the second king, is ascribed the foundation of a religious organization. Tullus Hostilius is credited with the overthrow of Alba Longa and the raising of Rome to the headship of the Latin League. To Ancus Martius, the fourth king, is attributed the final conquest of Latium and foundation of the first colony at Ostia. The last king was Tarquinius Superbus (534-510), who disregarded the first steps to democracy inaugurated by his predecessors, and was expelled.

Early Expansion; the Struggle of the Orders. The second period of Roman history (510-287) is concerned chiefly with developments in the constitution, and with the gradual conquest of that part of Italy lying to the south of the Apennines.

The new constitution provided for the election of two consuls, who practically divided the ancient powers of the kings, but were limited by annual tenure of office. They were elected by the *Comitia Centuriata*, for which the qualification was one of property, and which was composed of both patricians and plebeians. The plebeians, however, were excluded from election to office. In financial matters the consuls were assisted by two quaestors.

Before the close of the sixth century there were wars with the Etruscans and the Latins, in the latter of which a dictator was elected for the first time to supersede the consuls in war. In 494 the plebeians formed themselves into a corporate body and, on threatening to secede from the city, were granted increased powers which included representation by two tribunes (*tribuni plebis*). Subsequently the number of tribunes was increased.

Between 490 and 430 the Aequians and the Volscians were several times engaged in war with Rome, and were finally added to the growing Republic. In 449 the plebeians threatened to secede for the second time, and were granted further privileges under the Valerio-Horatian laws, which declared that



AN AERIAL VIEW OF ROME
St. Peter's and the Vatican territory are shown

plebiscita (resolutions of the plebs) should have the force of law. Shortly afterwards marriage was legalized between patricians and plebeians, and in 443 the office of Censor was created, thus still more limiting the power of the consuls and the patrician families. Finally, in 367 the Licinian laws were passed, admitting plebeians to the consulship and making it compulsory for one consul to be chosen from their ranks. In addition the office of *Praetor* was created for the administration of justice.

The Punic Wars: Effects on the Republic.

The next period, to the fall of Carthage in 146, was the time of Rome's most successful and most aggressive expansion. The long-standing feud with Carthage came to a head in 264, when a war was waged which lasted until 241. The conquest of Sicily had a very important result in the establishment of provincial government, which was entrusted to magistrates with practically independent authority. About this time successful campaigns were fought against the Gauls and the barbarians of Spain. By 220 all Gaul south of the Alps had been conquered. Hostilities with Carthage were resumed in 218 and persisted until the close of the century. The figure of Hannibal looms large at this time. He invaded Italy and induced

the Italian allies to revolt against Rome. Spain, Sicily and Sardinia were all involved (see HANNIBAL). The war was ended by the battle of Zama in 202, and peace was made by which the whole of Spain was ceded to Rome. Five years afterward the wars with Philip V of Macedon and with Antiochus Epiphanes of Syria continued the tale of conquest, so that by 160 Rome was

the dominating power in the Near East. After the third Punic War (149-146), the Province of Africa was formed.

These events had two well-marked results—the introduction of foreign culture into Rome, with the consequent growth of an interest in literature and the arts, and a great increase in the wealth of the leading Roman families. Taxation at Rome

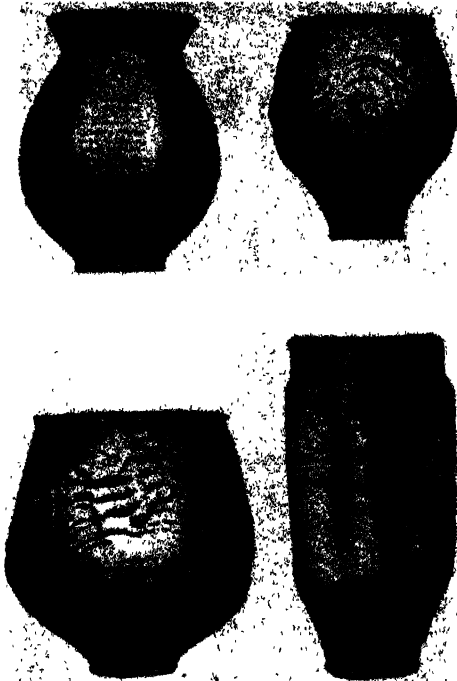


THE CLOACA MAXIMA
One of the sewers of ancient Rome. It is still in use.

became negligible and was superseded by revenues derived from the provinces. The ever-increasing size of estates in Italy drove the small farmer from the land, since agricultural labourers were drawn from the ranks of slaves. These dispossessed farmers swarmed to Rome to find work, but finding none, created the problem of unemployment. The equestrian order gained power, but, being excluded from the Senate, had interest in government. The Senate, winning popularity for its conduct of the foreign

wars, obtained an increasing ascendancy, while the Assembly of the people, in whom theoretically was vested the right to legislate, became unmanageable, and was more and more subject to the sway of demagogues.

The actual events of the last century followed an orderly and inevitable sequence. The year 133 witnessed the first attempt at



ROMAN POTTERY VASES

Dating from the second to the fourth century.

Photos: British Museum

reform, carried out by Tiberius Gracchus. See GRACCHUS.

After a peaceful interval, in which Rome strengthened her hold on Africa and Gaul, the next reformer appeared in the person of a soldier, Caius Marius, who was the first to force legislation by the support of the army. See MARIUS.

In 91 a war between Rome and her Italian allies broke out, which, in conjunction with activities against Mithridates the Great in the province of Asia, brought the city to great extremes. In 88 Cornelius Sulla was displaced from the command against Mithridates in favour of the now aged Marius. Sulla thereupon marched on Rome and made himself master of the city. He then departed for the East to resume the war. In 87, during the absence of Sulla from Rome, Cinna, one of the consuls, called on Marius

to return. The invitation was accepted, Marius marched on Rome at the head of his army and again, by force of arms, was elected consul with Cinna. Marius shortly afterward died, but for three years Cinna was in undisputed command of the city. His regime was only terminated by his murder in 84. Sulla thereupon returned at the head of another large army and demanded recognition for his services. His demands were refused. A Civil War ensued, ending in the complete victory of Sulla, who as dictator secured authority almost equal to that of the early kings.

Pompey and Caesar. The restored constitution was short-lived. In 71 another triumphant general, Cnaeus Pompeius, overruled the constitution and was elected consul together with Crassus, the most influential of the equestrian order. After passing laws which again limited the authority of the Senate and restored a more popular form of government, Pompey, like Sulla, retired into private life. He was recalled in 66, however, to take command in the new (third) war against Mithridates.

Events came to a head in 60, when Pompey returned victorious, and finding himself unable to obtain adequate terms for his disbanded army, allied himself with the rising Julius Caesar and with Crassus, as a result, Caesar was elected consul in 59.

Further popular legislation followed, and at the end of his consulship, Caesar was given command of the Province of Gaul for a period of five years, contrary to law, a period which was subsequently extended for a further five years. 57 to 50 was the period of Pompey's ascendancy, during which his sympathies veered towards the Senate, so that when the time came for Caesar's return from Gaul in 49, he sided with the senatorial party in refusing Caesar's demands for himself and his army. The result was that Caesar crossed the Rubicon from Gaul into Italy with a loyal army and marched on Rome.

This marks the end of any attempt at constitutional government. Caesar was completely successful over Pompey's party and had soon made himself master of the whole of the Roman dominions. As virtual dictator, he consolidated his own position and established what was in fact a monarchy.

The Empire. On Caesar's murder in 44, a further brief period of internecine conflict ensued, but it was found impracticable to restore a Republican government. After the Battle of Actium, Octavian, who afterward assumed the title of Augustus, obtained a position which was equal in power to that held by Caesar, and rested on surer foundations.

Augustus was a man of genius, and the permanence of his constitution resulted from the superiority of its administration. The chief force behind the dictator or *princeps*, as he came to be called, was still the army, which now became a standing force of professional soldiers; but the character of the army developed from that of a constantly-changing force of victorious volunteers to that of a permanently established emblem of law and order.

After the death of Augustus there was no opposition to the accession of his nominee Tiberius, so that, in practice, but not in theory, the principate became hereditary, and the Roman Empire finally established.

Tiberius proved able but unscrupulous. Suspicious by nature, he protected himself with a multitude of armed guards and civil informers. During the reign of Tiberius occurred the Crucifixion of Jesus of Nazareth. His successors were Caligula (37-41), who unfortunately lapsed into insanity; Claudius (41-54), a vacillating emperor whose most notable feat was the conquest of Britain, and Nero (54-68).

Many of the succeeding emperors were mediocre men, who obtained their power by bribing the army. Vespasian and Titus, Nerva, Trajan, Hadrian, Antoninus Pius, and Marcus Aurelius were exceptions to the general rule. It was during the reign of Trajan that the Roman Empire reached its greatest extent, for Hadrian, realizing that far-distant frontiers were but a danger to the empire, abandoned the territories beyond the Euphrates.

The Decline of the Empire began with Commodus (180-192), and proceeded slowly at first, but later with great rapidity. The army became the dominant force, and for almost a hundred years (193-284) placed upon the throne one after another of the "barrack emperors," so called because they were placed in power by the army. The first of them, Septimius Severus (193-211), was the ablest. A second persecution of the Christians took place during his reign. A temporary respite came with the reign of Severus Alexander (222-235), but after his death chaos and anarchy followed.

Diocletian (284-305), under whom occurred the last persecution of the Christians, divided the state into East and West empires, making Maximian joint emperor. Under Constantine, who was sole ruler from 323 to 337, the state was again united. He made Christianity the State religion, and moved the centre of government from Rome to a newly founded city on the Bosphorus, which he called Constantinople. After Constantine's death came another period of wild disorder. Julian (361-363), called *the Apost-*

ate, tried to restore paganism, but the Church had become too strong to be overthrown.

The Fall. Occasionally, an emperor or a general arose who was strong enough to beat back the barbarians—Huns, Goths, Franks, Alemanni, or Vandals—who were threatening the frontiers. Theodosius the Great (379-395) might in a more favourable time



ENAMELED BRONZE ALTAR
Representing an altar
Photo: British Museum

have proved one of the strongest of the emperors, but even his efforts were in vain. In 410, when the genius of the famous general Stilicho was no longer opposed to them, the Goths, under Alaric, ravaged Italy, and for three days pillaged Rome. The legions had to be withdrawn from the provinces to protect the city, and everywhere the barbarians pressed in. The Visigoths took Spain and Southern France, the Vandals possessed themselves of Northern Africa, and the Huns laid waste the Eastern districts. In 451 the Huns, under Attila, were turned back from Rome only by the pleas of Leo the Great, Bishop of Rome. Four years later, the Vandals sacked the city, and then for a period the Suevic chief Ricimer was supreme in the city.

The powerless ruler in 476 was a boy, Romulus. Perceiving his weakness, Odoacer

placed himself at the head of a large force of mercenaries, dethroned Romulus, and took the title of king of Italy. Thus the Roman Empire was brought to an end, though, in the time of Charlemagne, the name came into vogue again in connection with the Holy Roman Empire, and the East Roman Empire subsisted until the fall of Constantinople in 1453.

The Ancient City. Rome, to the time of Augustus, was a mixture of squalid streets—the butt of the satirists—and magnificent state buildings, many being built of marble.



ROMAN MILITARY TYPES
General (left) and Legionary
Photos: British Museum

The centres of the city's life were the *fora*, or open places for public meetings.

Within the city the chief street was the *Via Sacra*, or *Sacred Way*, which ran from the Forum to the summit of the Capitoline Hill, where stood the temple of Jupiter. Here passed triumphal processions of the emperors and generals, as they returned from victorious wars. The *Cloaca Maxima* (main sewer) is still in use, as are the aqueducts through which water was brought to the city from the Apennines.

There were no fewer than three hundred temples at the height of Rome's supremacy.

There were numerous public baths. Of amphitheatres, the oldest was the *Circus Maximus*, built in the days of the kings, but the most famous was that known as the *Colosseum*. Another characteristic feature of the city was the series of triumphal arches, which the emperors built to commemorate their victories.

Popes and Kings. For some centuries after the fall of the empire, the city of Rome had no history but that of the Church. Latterly, its life has been merged in that of Italy as the capital city. In 1848 Pope Pius IX was driven from the city and a republic was formed, but in the next year French troops recaptured the city, and under their protection the Pope reigned until 1870, when Italian troops took possession. In the following year, the city became the capital of United Italy. The king took up his residence in the Quirinal, and the Pope became, according to his own description, a "prisoner in the Vatican." In 1929, by an agreement between Mussolini and the Vatican, an independent Papal State was established.

The population of Rome is 1,165,050 (1935). See ITALY; VATICAN CITY.

Italy's Capital To-day. Modern Rome is about 15 miles in circumference. About it stretches a wall which is in large part that built by the Emperor Aurelian, and within this the Tiber divides the city into two unequal parts. On the right bank are the Vatican City and St. Peter's, and a populous section has sprung up around them; but the larger part of the city is on the other side of the Tiber. Ten bridges cross the river within the city walls.

The Palatine Hill is now in part a public park, in part a mass of ruins, among which excavations are still being made. On the Aventine and Caelian hills, too, are ruins and little else, while on the Esquiline and Viminal have sprung up crowded industrial quarters. The Quirinal, near the centre of the modern city, is crowned by the royal palace and the chief public buildings. Of Renaissance buildings, the Capitol, designed by Michelangelo, stands on the Capitoline Hill. The Palazzo Venezia is Mussolini's residence.

A five-year city-planning programme was inaugurated in 1926, under the direction of a chief architect. The new Rome is a well-organized modern city. The "University City" was opened in November, 1935.

Since 1925 Rome has been under the control of a governor appointed by the king. He is assisted by two vice-governors, ten lower officials, and an advisory council of eighty.

ROMNEY, rum' ni, GEORGE (1734-1802). An English painter, a contemporary of Reynolds. Romney was born at Dalton-in-Furness in 1734, and while working as a cabinet-maker received drawing lessons from a strolling artist. After practising portrait and subject painting in provincial towns, he came to London in 1762, and in the following year his historical painting, "The Death of General Wolfe," won a prize. Prospering as a portrait painter, Romney visited Italy, and on his return became very popular and a



nival of Reynolds. He had a keen sense of rhythmic design, but his work is usually hard and mannered, although he was skilled in the portraiture of men, as seen in his "Beaumont Family Group" in the National Gallery. His many portraits of women, especially those of Lady Hamilton, are of less artistic value, but his "Lady and the Child" (National Gallery) is exceptionally good. He died at Kendal in 1892.

ROMULUS, *rom' u lus*. The legendary first king of Rome and the founder of the city. He and his twin brother Remus were, by tradition, sons of Mars and Rhea Silvia, daughter of Numitor, king of Alba Longa, and her two babies were thrown into the River Anio, where she became a water nymph, while the boys were carried down into the Tiber, which cast them ashore at the foot of a fig tree. Here they were found by a she-wolf, who cared for them, until they were found by the shepherd Faustulus.

Their identity was finally discovered by Numitor, who was assisted by them to recover his throne, which had been usurped. They then proposed to build a city by the banks of the Tiber, but not being able to agree, invoked the oracle to decide between them. The decision was given in favour of Remus, and Remus was shortly afterwards slain by his brother in a quarrel. Before the death of Romulus, the Sabines had been added to Rome's dominion. See QUIRINUS, ROMULUS.

ROMULUS AUGUSTULUS. See ODOACER, ROMULUS (The Fall).

RONALD, SIR LONDON (born 1873). A London-born conductor, pianist and composer, and an early student of the Royal College of Music under Parry, Taylor, and other masters. His works include the songs

Down in the Forest and *Love in Absence*, and a *Ballade* for the pianoforte, but he is best known as a conductor and the Principal of the Guildhall School of Music, a post to which he was appointed in 1911.



SIR LONDON RONALD
Photo Central

RONDO. A form of musical movement in which a first section is repeated at intervals, separated by episodes which may be either different or the same at each reappearance. See Music.



ROOD SCREEN AT PAIGNTON CHURCH, DEVON
Photo. Frank

ROOD SCREEN. The screen is the structure in stone or wood which in many churches is built across the entrance to the chancel, dividing it from the nave. Upon this the rood or crucifix was often erected, with the addition of statues of the Virgin Mary and Saint John on either side of the central figure. Hence the term "rood-screen."

The screens were originally erected in order to divide off the choir, where the monks performed their private offices of devotion from the body of the church, used for the public worship of the people.

ROOF. The cover of any building, including the materials necessary to carry and maintain its weight. As the purpose of roofs is shelter, climate has been a chief factor in their design. The Syrians and Egyptians have cloudless skies and hot sun; the result was a flat roof, with no slope to lower the height of the walls of the rooms below. In Northern Europe, where deep snows of winter do not disappear until washed away by spring rains, architects planned a steep roof, which readily shed snow and rain. From these two simple designs have developed types of roof as diversified as the gable, hip, gambrel, lean-to, mansard, dome, and arch.

Greek architecture favoured roofs of marble and terra cotta; Roman engineers devised a method of spanning broad spaces with vaults or domes of brick. But it was the medieval creators of Gothic architecture who developed a ceiling or inner roof of stone vaulting, with an outer roof of boards covered with lead, slate, or tile.

Churches, castles, tithe barns, and the larger manor houses participated in these improvements, while the cottages of the poor usually remained thatched. Many thatched cottages survive in the rural districts of England. Buckland-in-the-Moor (Devon) and Chiddingstone (Kent) are typical examples of villages composed mainly of thatched cottages.

The materials for construction of roofs elaborated by the Greeks and medieval builders are still used, though current practice has in many cases replaced wood and stone with iron and steel; and while modern invention has added to the list of roofing materials asbestos shingles, tar paper, and corrugated iron, tiles and slates are still the commonest materials. Many modern buildings are of monolithic concrete construction. The roof is built exactly as the floors below have been, and is of concrete, sometimes laid in pre-cast beams.

If the height of the roof is one-half the width which it covers, it is said to have *one-half pitch*. Similarly, roofs are frequently *one-third pitch*, *one-fourth pitch*, and so on. The horizontal distance from the edge of a roof to a point beneath its peak is called the *run*, the perpendicular height of the peak above the edge is called the *rise*. In a *one-half pitch*, therefore, the run equals the rise.

ROOK. A large bird belonging to the crow family. Rooks are almost entirely

black, even to the bill and feet, except for a slight greyish patch on the sides of the head in adult birds. The distribution of rooks extends throughout northern Europe and Asia; there is a slight difference between the Western and Eastern forms.

Rooks are gregarious in habit and nest together in what is called a rookery. These nesting colonies, generally situated in trees, are quite common in Britain.

The food is varied, but consists mainly of grain and insects.

Scientific Name. The rook belongs to the family *Corvidae*. It is *C. frugilegus*.

ROOKE, SIR GEORGE (1650-1700). An admiral Rooke at the Battle of La Hogue in 1692 commanded the boat flotilla which entered the French harbour and destroyed six enemy men-of-war. His moral courage was not equal to his fearlessness. His delays off Lough Foyle in 1689 had considerably lengthened the siege of Derry. In 1702 he was sent to take Cadiz. His hesitations were largely responsible for the failure, but he took Vigo and destroyed the Indies treasure fleet. In 1704 he commanded the fleet that took Gibraltar in a hard but drawn battle off Malaga, prevented its recapture.



SIR GEORGE ROOKE
National Portrait Gallery

ROOSEVELT, FRANKLIN DELANO (BORN 1882). Elected in 1932 as the thirty-second President of the United States, he is a fifth cousin of Theodore Roosevelt, the twenty-sixth President.

Franklin Roosevelt received his early education from tutors in America as well as in Germany and France, and thereafter attended Groton School, Harvard University, and Columbia University Law School. In 1907, Roosevelt was admitted to the bar and began the practice of law in New York City. In 1910 he was elected to the New York legislature as a Democrat.

As the Presidential campaign of 1912 drew near, Roosevelt worked for Wilson's nomination. On the latter's election, Roosevelt was rewarded with the post of Assistant Secretary of the Navy. In 1920 he was nominated for Vice-President but was defeated. In 1928 he was elected Governor of New York, and in 1930 re-elected. Evidence of his popularity in this State, with the



ROOK
Photo: John Kerrison

largest number of electoral votes, inevitably made him a strong candidate for the Presidential nomination in 1932. He was elected by a large majority over Herbert Hoover.

His Tasks as President. Roosevelt was faced with a national problem that was as deeply psychological as it was economic. The country was near to panic. Over 30,000,000 people were in need of some measure of relief. Practically every bank in the country was closed, either by voluntary action, depositors' runs, or by Governors' Proclamations. Nearly all industry was prostrate. Scarcely a railway was earning its fixed charges; farm produce was ungathered and unsaleable, and the greatest and most powerful corporations, industrial and public utility, were losing capital rapidly.

Roosevelt's first great task was to restore the confidence of all classes. He had to banish the despair which made it completely impossible to restart the machinery of industry. Drastic decisions had to be taken at once. "The almost complete collapse of the American economic system called for the tearing down of many unsound structures, the adoption of new methods and a new rebuilding from the bottom up," was how he described his initial tasks. To end the banking crisis, his first act was to declare a three-day "bank holiday," which was, in effect, the inauguration of a far stricter governmental control over banking than America had ever previously known.

The "New Deal." Roosevelt's next step was to send a message to Congress recommending the immediate modification of the Volstead Act, to legalize the manufacture and sale of beer and other alcoholic drinks, and by substantial taxes on these beverages to raise much needed revenue. Then he initiated a series of schemes designed to take the unemployed young men off the streets, forming Civilian Conservation Corps, and commenced a public works labour-creating programme on an extensive basis. One of his early acts was to create the Tennessee Valley Authority to control a project to bring into economic use hundreds of square miles of territory.

By such measures as the Farm Relief Act, the Agricultural Adjustment Act, the Railroad Act, and the National Industrial Recovery Act, Roosevelt inspired Congress to re-vitalize the whole of the industrial and agricultural machinery of the country, hoping thereby to increase the income of farmers and workers and to usher in a new era of prosperity. Full success he hardly expected, and has not achieved. Mistakes, he admits, were made, but he rightly took the view that the N.R.A. (which see) was probably the most important piece of legisla-

tion ever passed in America. Such legislation was generally approved by the majority of the nation, and though later such important measures as the Agricultural Adjustment Act and the National Recovery Act were nullified by the Supreme Court, they achieved their main purpose of re-starting industrial and financial machinery.

In foreign affairs, Roosevelt has followed a conciliatory policy. Though beset by many searching problems in the early days of his administration, he found time to show his interest in the relationship of his country with the twenty other South and Central American republics. As President, he showed a keen desire to co-operate with the League of Nations, and when the Disarmament Conference at Geneva was encountering heavy weather in the summer of 1933, he endeavoured to pour oil on the troubled waters by an appeal to the nations, in which he advocated that all the nations of the world should enter into a solemn and definite pact of non-aggression, that they should solemnly re-affirm the obligation to reduce armaments. The Neutrality Bill, which operated in accord with the policy of the League, was his answer to Italy's aggressive policy in Ethiopia.

In November, 1936, he was re-elected for a second term by the largest majority accorded a President since Monroe in 1820.

ROOSEVELT, THEODORE (1858-1919) Twenty-sixth President of the United States.

Roosevelt was born in New York City, descended from a family of Dutch burghers, one of whom emigrated from Holland to "New Amsterdam" about 1650. In 1881 he was elected to the New York assembly. Although in disfavour with the bosses, Roosevelt was the most influential man in the assembly. In 1884 he refused to accept another nomination for the legislature.

In 1889 he was given a place on the Civil Service Commission.

In 1895 he became president of the police board of New York City. For the next two years he laboured to eradicate corruption from the police force.

In April, 1897, President McKinley recalled Roosevelt to Washington to become Assistant Secretary of the Navy. To Roosevelt belongs most of the credit for whatever



THEODORE ROOSEVELT
Photo: Brown Bros.

preparedness the American navy possessed when the war with Spain broke out.

In consequence of this success, Roosevelt was elected governor of New York, and his record in that office was a remarkable one. He directed an investigation of the State's canal system, about which there had been much talk of fraud, and incurred the hostility of large corporate interests by approving a bill providing for the taxation of corporation franchises. He was too troublesome a man to be endured in places of power, and the politically powerful determined to render him harmless by making him Vice-President (March, 1901).

The Presidency. Six months after his inauguration, however, Roosevelt became President through the assassination of William McKinley.

During the whole of his administration, President Roosevelt wielded a tremendous influence on Congressional law-making. The establishment of a Bureau of Immigration and a uniform naturalization law were other important laws due to him.

Foreign Policy. Throughout Roosevelt's administration, foreign relations presented many knotty problems. For the most part, these involved South or Central American republics, and by far the most important concerned the Panama Canal. The most remarkable episode in foreign relations, however, was the President's action in bringing together the Russian and Japanese peace commissioners, and thus being directly responsible for the conclusion of the Russo-Japanese War in 1905. For this work he was awarded the Nobel Prize for Peace.

Immediately after the close of his term, Roosevelt sailed for Africa with a party including a number of naturalists.

While Roosevelt was away, there occurred the Ballinger-Pinchot controversy between the conservatives and radicals in the Republican party. Out of this dispute grew the Progressive party, which nominated Roosevelt for the Presidency in 1912.

Woodrow Wilson, the Democratic candidate, was however elected. After the election of Wilson, Roosevelt made an exploring trip into the interior of Brazil.

Beginning in 1913 and continuing until 1917, when the United States entered the World War, Roosevelt was the chief critic of President Wilson's foreign policy.

Roosevelt's health had been seriously impaired on his Brazilian trip, but when death took him, in January, 1919, he was anticipating further public service.

Roosevelt's literary work is itself sufficient to have given him a wide reputation. His writings have been collected in twenty-five volumes, ranging from scholarly historical

essays or biological studies to entertaining narratives of his personal experiences.

ROOT. In mathematics, a number or quantity which, when multiplied by itself one or more times, produces a given number or quantity. For example, since $2 \times 2 = 4$, 2 is a root of 4 (the square root); again, since $3 \times 3 \times 3 = 27$, 3 is a root of 27 (the cube root).

ROOTS. One kind of the three vegetative organs essential to plant growth, the others being the stems and the leaves. The chief functions of roots are to hold plants in their places in the earth, and to supply them with water and nutrient salts from the soil. The first-formed roots, those that grow directly from the rudimentary stem, are called *primary*; branches of the primary roots are called *secondary*, and branches of these, *tertiary*. Roots which grow on the stem or in other unusual places are known as *adventitious*. In most cases, the root system branches freely. The smaller rootlets are covered with tiny *root hairs*; the region of root-hair production constantly advances as the root tip grows, but is always about one-fourth inch behind the tip. These root hairs play an important part in the development of the plant by taking up water from the soil.

According to the medium in which they grow, roots are classified as *soil*, *aerial* (or *air*) and *water roots*. Air or sub-aerial roots are sometimes developed by plants which are anchored in the ground, e.g. the ivy, but there are other plants which grow entirely in the air, as do many tropical orchids. Roots that derive nourishment from other plants are called *parasitic*, such as the roots of the mistletoe. Wherever situated, the roots must have oxygen to remain alive. The upper parts of the plant cannot supply the roots with this essential gas, therefore air must be available through the soil or water.

Roots are also distinguished in regard to form. A primary root which grows to be much larger than any of its branches is called a *tap-root*, and if this tap-root becomes thickened and later develops as a storehouse for nourishment, as in case of the carrot or turnip root, it is said to be *fleshy*. A cluster of thickened primary roots, such as those produced by the sweet potato and dahlia, would be called *fascicled* roots. Thread-like roots, such as those of most kinds of grass, are *fibrous*. See BOTANY. GERMINATION, etc.

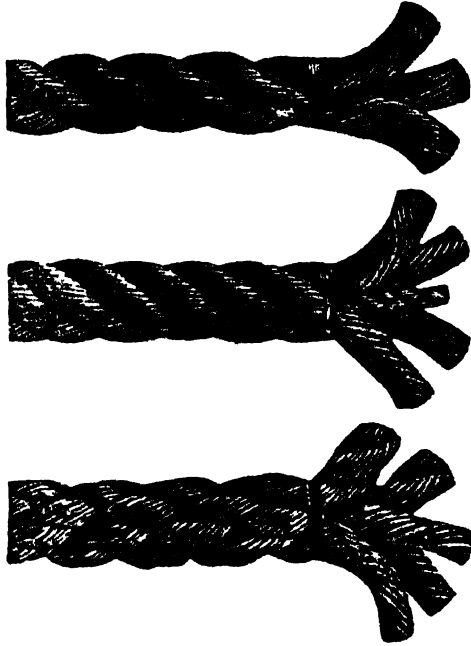
ROPE. The distinction between a rope and a cord is in the size alone. The term *rope* is applied to a cord one or more inches in diameter, and the term *cordage* to all smaller cords down to the size of twine, excepting ropes made of wire.

Hemp, abaca, sisal, flax, jute, cotton, and

coir, the latter being the fibre from the husk of the coconut, are the materials used in the manufacture of ropes. See separate articles.

Manila hemp is preferred for all cordage where strength is required, because its fibres are longer and stronger than those of sisal or jute. See **FIBRE**.

Manufacture. Hemp is received at the factory in bales averaging about 270 lb. each. The fibre is taken from the bales,



THREE KINDS OF ROPE

From top to bottom: three-strand rope, four-strand with centre core; cable-laid rope. The latter is made for purposes that require springiness—rope that will stretch and then return easily to its original length. Such rope is used in drilling operations and for anchoring smaller types of vessels.

loosened, and sprinkled with oil. It is then passed in layers through a machine called a *spreader*. From the spreader, the hemp passes to the *breaker*, which straightens out the fibres and arranges them in a ribbon called the *sliver*. The sliver passes through several breakers, each finer than the other, until the fibre is prepared for spinning. As the fibre is spun into yarn, it is wound on large bobbins holding about 1000 yds. each. The smaller ropes consist of three strands; this number is increased for larger ropes.

Strength of Ropes. The strength of a rope depends upon its size and the material of which it is made. A hemp cord 1.53 in. in circumference will withstand a strain of 1670 lb. One 6.9 in. in circumference will lift a weight of 33,808 lb. Twenty-three-inch

cables have been made; these are strong enough to lift a large locomotive.

Wire Ropes. Wire ropes are made of a number of steel wires twisted together, usually over a hemp core or "heart." Wire ropes are extensively used for cables, for ship rigging, and in derricks for lifting heavy weights; and for many other purposes they have entirely displaced fibre ropes. See **WIRE**.

RORQUAL, *ror' kwal*. The popular name for a group of whales found in nearly all sea waters. See **WHALE**.

ROSA, MONTE. See MONTE ROSA.

ROSACEAE, *ro zay' se e*. See ROSE.

ROSAMOND, *roz' a mund* (about 1140—about 1176). The mistress of Henry II of England, generally known as "fair Rosamond." Most of the stories told concerning her are legendary. Fourteenth-century chroniclers declared that she was poisoned by Eleanor, Henry's queen. She was buried in the nunnery church of Godstow, but in 1191, Hugh, Bishop of Lincoln, had her body moved to the Chapter House.

ROSARY (*rosarius*, lit. a garland of roses). A string of beads used by Roman Catholics to count the Hail Marys and Our Fathers which compose the form of prayer or devotion known by the same name. The devotion consists of reciting fifteen decades (or tens) of Hail Marys with an Our Father (Lord's Prayer) between each decade, meditation being made in the meantime on various mysteries connected with the Redemption. The practice of using beads or other mechanical means of counting prayers which are devotionally repeated is found in many countries and in many ages. There is evidence for the practice among the Christians of the fourth century, and Buddhists and Mohammedans have long used beads for a similar purpose.

Although the use of beads for counting prayers is thus very ancient in the Christian Church, the devotion of the Rosary in its present form made its first appearance in, or soon after, the twelfth century. Its origin in the Catholic Church is traditionally, but with doubtful accuracy, attributed to Saint Dominic himself.

The term is also used for a rose garden or path flanked with rose bushes.

ROSCOMMON. The county town of County Roscommon in the Irish Free State. At the last census the population was 1830. It is about 96 miles from Dublin on the western section of the Great Southern Railway System. It is an agricultural centre and market town. There are remains of a Dominican abbey and castle, the former founded for Dominicans by the King of Connaught in 1257, and the latter built

originally in 1268. The castle was destroyed during fighting in 1272, but was rebuilt in 1276. It was frequently changing hands in many conflicts between chieftains in later years, but is said to have been inhabited up to the year 1691. See CONNAUGHT.

ROSCOMMON, WENTWORTH DILLON, FOURTH EARL OF (about 1630-1685). English poet and critic, born in Ireland. He was a nephew of the Earl of Strafford. Roscommon is remembered especially for a translation, in blank verse, of the *Ars Poetica* (*Art of Poetry*) of Horace, and for an *Essay on Translated Verse*, in which he stated the principles of poetic diction. His poems were collected in 1701. Roscommon was buried in Westminster Abbey.

ROSE. The name borne by a genus of flowers that grow wild in practically all temperate regions, and on the mountain



WILD ROSE

heights in the tropics. The oldest cultivated species comes from Persia and Northern India.

In English history, a red and a white rose were the respective emblems of the rival houses of Lancaster and York (see *ROSES, WARS OF THE*). Persia has for its national flower the Cherokee rose, a white Chinese rose also naturalized in the southern United States. Roses flourish particularly well in mild climates. The finest new varieties are developed in Britain.

Kinds of Roses. The rose genus has given its name to one of the most important families of the plant kingdom (see *Rose Family*, below); of this family it may be considered the type. Roses grow in such a variety of soil and climate, and adapt themselves so readily to cultivation, that different varieties have been developed by the hundred. In its natural state, the rose plant is an erect or climbing shrub, which bears thorns and single flowers having five petals. The flowers borne by cultivated varieties are generally double, and some forms have been produced

that are thornless. Floriculturists recognize two main classes of cultivated roses—those that bloom once a year, usually in early summer; and those that flower more than once in a single season. The latter are known as *perpetual* roses, and the large majority of roses to-day are what are known as *hybrid perpetuals*. They are the result of interbreeding, and have the hardihood of the one class and the free-flowering habit of the other. All cultivated varieties are developed originally from the wild rose. Among the numerous species are the dog rose (*Rosa canina*) and the sweetbrier, or eglantine (*R. rubiginosa*), of English hedges; the sweet-scented musk rose (*R. moschata*), the cabbage rose (*R. centifolia*), the moss rose (*R. muscosa*); the Damask rose (*R. damascena*), the parent of many modern perpetuals; the Japanese rose (*R. rugosa*); and the China rose (*R. indica*) from which some of our Tea roses have been derived. The ramblers, the climbers and the Pernetianas each have their parent in species found in various parts of the world. Weeping and standard roses are beautiful varieties developed by the skill of nurserymen and specialists. Colours vary from white through cream and pink to red.

Most roses are grown from slips, cuttings and by budding on to briar stocks, but new varieties usually originate as seedlings.

The best time for planting is the autumn, for during the winter the plant can form a strong root system before it is called upon to send out shoots; though roses can be grown successfully if planted in the spring. Care should be taken to have the plants so arranged that the beds can be easily watered and weeded. A good general rule is to have the beds not over 5 ft. wide, and the rose plants from 18 in. to 2 ft. apart each way, according to their habit of growth. An essential point in successful rose cultivation is to keep the surface soil well hoed during the growing season.

The Rose Family. Botanists combine all members of this family of plants under the name *Rosaceae*. In the family are about 2000 species of trees, shrubs, and herbs. To it belong the apple, pear, and quince, the berries, almond, peach, apricot, plum, and cherry. Its numerous ornamental plants include the rose, the meadowsweet, the mountain ash, and the hawthorn. Many useful products are yielded by rosaceous plants, such as oil of bitter almonds, attar of roses, and several fine cabinet woods. The plants of this family bear regular flowers, each having five petals, a five-lobed calyx, numerous stamens, and one or more carpels (see *FLOWERS*). As they are seed-bearing plants, they are classed as *angiosperms*, and because

SOME MEMBERS *of the* ROSE FAMILY



they produce two seed-leaves, they belong to the *dicotyledonous* plants.

ROSEBERY, ARCHIBALD PHILIP PRIMROSE, FIFTH EARL OF (1847-1929). Son of Lord Dalmeny, he was educated at Eton and Christ Church, Oxford, and succeeded to the title in 1868, on the death of his grandfather. In the House of Lords he speedily acquired a reputation as a forceful speaker, advocating various measures for the assistance of the working classes. His first office was the Under-Secretaryship for Home Affairs, which he received in 1881 and held for two years, resigning because there was considerable

opposition to a member of the House of Lords holding that post. He had been chosen Lord Rector of Aberdeen University in 1878 and of Edinburgh University in 1880, when he delivered his famous rectorial address on Patriotism.



LORD ROSEBERY
Photo Topical

In 1889 Lord Rosebery became chairman of the first London County Council, and in 1892 was given by Gladstone the post of Foreign Secretary in the new Liberal Cabinet. When Gladstone resigned in 1894, Rosebery became Prime Minister. Lord Rosebery was always an eighteenth-century Whig rather than a nineteenth-century Liberal. Gladstone and his followers, in reaction against the Imperialism of Disraeli, tended to concentrate on home affairs. Rosebery himself was as interested in the colonies as in "parish pump politics." The more Radical elements in his party thought him insufficiently democratic and objected to being led by a peer. The Irish Nationalist Party felt that he approached the Home Rule question from too English an angle. He was, however, personally popular. The Ministry endured for only fifteen months. Lord Rosebery remained leader of the Liberals, however, until October, 1896, when he broke with the party on the question of intervention in Turkey.

From that time, he took no active part in party politics. He supported Lord Salisbury's Conservative Government during the South African War of 1899, he and his followers becoming known as the Liberal Imperialists. This attitude caused a serious breach with the orthodox Liberal Party, a

breach partly healed a few years later by common dislike of Joseph Chamberlain's Protectionist policy. He bitterly criticized the Parliament Bill of 1911, and proposed reforms within the House of Lords, introducing more democratic elements. To show his contempt for the impotence of the reformed House of Lords, Lord Rosebery refused to attend the debates. At the outbreak of the World War, he served by encouraging recruiting and other war activities, and helped to prevent a premature peace through his influence and public speeches. He lost his younger son, the Hon. Neil Primrose (1882-1917), in the war.

In 1911, when King George V was crowned, Lord Rosebery was made Earl of Midlothian (an English earldom, while Rosebery was a Scottish earldom). At the coronation of both King Edward VII and King George, Lord Rosebery was one of the peers who bore the canopy at the ceremony.

Even if he had abstained from politics Lord Rosebery would have been a well-known figure. He was a brilliant conversationalist and orator, and was master of a varied and beautiful prose. His style and his mental attitude have been described by Edmund Gosse as belonging to the eighteenth century, not in imitation but by natural bent. His writings include studies of Chatham, Peel, Oliver Cromwell and Lord Randolph Churchill, as well as his *Napoleon—the Last Phase*. Beside these are a number of essays and addresses, of which two collections have been made—*Appreciations and Addresses and Miscellanies, Literary and Historical*. Rosebery was extremely popular on the turf, and his three Derby victories in 1894, 1895 and 1905 aroused great enthusiasm.

ROSEMARY. An evergreen shrub of the mint family, noted for the aromatic fragrance of its leaves. It is a native of the Mediterranean region. Rosemary grows from 4 to 8 ft. high, and bears dark-green leaves with a grey under surface, and tiny pale-blue flowers. It is easily propagated by cuttings.

Rosemary yields an oil which is used chiefly in perfumes and in aromatic waters. The plant is an emblem of fidelity and remembrance.

Scientific Names. Rosemary belongs to the family *Menthaceae* (or *Labiales*). Its botanical name is *Rosmarinus officinalis*. It is the only species known.

ROSE OF SHARON. The plant usually known by this name in Britain is the low-growing St. John's Wort, a shrubby perennial plant bearing large, solitary yellow flowers. It is naturalized in the British Isles.

Scientific Name. *Hypericum calycinum*

ROSES, WARS OF THE. In English history, the struggle in the latter part of the

fifteenth century between the House of York and the House of Lancaster for the possession of the English throne. The House of Lancaster took as its emblem a red rose, the House of York a white rose, and from these insignia came the name given to the conflict. Both Houses were Plantagenet, being descended from Edward III, Lancaster from John of Gaunt, his fourth son, and York, in the female line, from his third son, Lionel, Duke of Clarence, and, in the male line, from his fifth son, Edmund of Langley.

At the outbreak, the king was Henry VI, a grandson of the Lancastrian Henry IV, who had seized the throne in 1399; his chief opponent was Richard, Duke of York, nephew of Edmund Mortimer (see MARCH, EARLS OF, and YORK, DUKES OF). Since the accession of Henry VI the Crown had been weak and the nobility dangerously powerful. Discontent at inefficient rule had been deepened by defeat in the French Wars, which were proving both expensive and humiliating. Henry VI was respected as a saint but ignored as a sovereign, and his dominant wife, Margaret of Anjou, was hated by many. It was inevitable that men should remember the stronger hereditary claim of York.

In 1449, fury at the final loss of Normandy caused the dismissal and murder of Margaret's chief minister, the Duke of Suffolk (see SUFFOLK, DUKES AND EARLS OF). A year later Jack Cade led the Kentish peasantry on London. The revolt, which was suppressed with difficulty, seems to have been a protest against misrule rather than a Yorkist demonstration. Peace with France was made in 1453. In the following year Henry became insane and York was made Lord Protector. When the King recovered, Margaret appointed the Duke of Somerset as minister and dismissed York, whose followers took to arms.

The entire war is typified by its first battle in 1455, when the peaceful market-day at St. Albans was broken up by fugitive Lancastrians and victorious Yorkists. The whole affair was a faction fight on a large scale, the nobles, spurred on by ambition or by personal grudges or loyalties, leading their private forces and recruiting them from unemployed ex-soldiers. The law-courts still met, agriculture went on, and the people as a whole showed little interest, except when their pursuits were actually interrupted by the combatants. Each party branded its foes as traitors, so that after a battle the headsman was busy with prisoners of gentle blood.

At St. Albans Henry was captured and Somerset killed, and for some time the Yorkists were dominant. York's strongest

supporters were the Nevilles, the Earl of Salisbury and his son the Earl of Warwick. Margaret relied on the Beauforts, to whom Somerset had belonged, and the northern lords, Percy and Clifford. Roughly speaking, the North and West were inclined to Lancaster, and the South-east and Ireland held for York. In 1459 Salisbury won a victory at Bloreheath and Warwick another at Northampton. A reconciliation was arranged, York, recognizing Henry as king, was declared regent and heir-apparent, but Margaret could not endure this passing-over of her son Edward, the infant Prince of Wales, and the northern lords joined her banner. York was defeated and beheaded at Wakefield. In 1461 his son Edward, Earl of March, defeated Owen Tudor at Mortimer's Cross and marched on London. Margaret defeated Warwick in a second battle at St. Albans, rescuing her captive husband, but March occupied London and was proclaimed as Edward IV. He drove Margaret northward and on Palm Sunday won the most desperate battle of the war at Towton. The Red Rose sovereigns sheltered for a while in Scotland. Margaret resumed the struggle, but in 1464 Warwick's brother, Lord Montagu, was victorious at Hedgeley Moor and Hexham, and she fled with her son to France. Henry was captured and lodged in the Tower.

Edward deliberately encouraged the commercial middle class, which became definitely Yorkist. He offended Warwick who plotted against him with his brother George, Duke of Clarence. These two defeated and captured him at Edgecote Hill in 1470, when he had gone north to suppress a Lancastrian rising under Robin of Redesdale. Edward later collected his forces, and Warwick fled to France. Here he was reconciled to Margaret by Louis XI, whose chief enemy, Charles of Burgundy, had married Edward's sister, Margaret of York, and Warwick invaded England under the Red Rose banner. Edward, unprepared, escaped to Burgundy. In March, 1471, Edward landed at Ravenspur and was joined by his brother Richard of Gloucester and other Yorkist lords. Warwick collected the Nevilles and was joined by some Lancastrians under the Earl of Oxford. His Red and White forces mistrusted each other, a suspicion deepened by Clarence, who deserted to his brother's army. The Battle of Barnet began in dense mist; Warwick was defeated and slain. On the same day Margaret and Edward of Lancaster landed at Weymouth. They were defeated at Tewkesbury and the young Prince was slain, it is said by the King and his brothers. Henry died soon after and Margaret, now harmless, was allowed to return to her father in Provence.

The Lancastrians made no further effort until the accession of Richard III, when the general indignation at the suspected murder of his nephews revived their hopes. Henry Tudor, Earl of Richmond, descended from John of Gaunt through his mother, Lady Margaret Beaufort, landed in 1485 at Milford Haven. Richard, deserted by most of his own forces, was defeated and slain at Bosworth Field. This is accounted the last battle of the Wars of the Roses, in spite of the defeat of Lincoln and Lovel at Blackheath in 1487 (see SIMNEL, LAMBERT). The support given to Simnel and Warbeck was an attempted continuation of the struggle, for the marriage of Henry VII to Elizabeth of York had not satisfied the Yorkist party.

The Wars of the Roses broke the power of the old feudal baronage. Henry VII took the opportunity to check, by his Statutes of Livery and Maintenance, their keeping of private armies. The nation, disgusted by the long struggle, turned for protection to the Crown with an ardent loyalty which was the real foundation of the "Tudor despotism."

ROSETTA, *ro set' a*, **STONE**. The stone which gave to the world the key to the translation of the ancient Egyptian language. The stone is inscribed with a decree of the Egyptian priesthood, which had assembled at Memphis in 195 B.C. This decree, issued in honour of Ptolemy V Epiphanes (205-181 B.C.) was written in hieroglyphics (or picture writing), in demotic (a simplified form of Egyptian writing), and in Greek. Scholars were able to decipher the Egyptian texts by comparing them with the Greek, and in this way they found the clue to the hidden characters of the language of the ancients. Chief honour for the work of deciphering the hieroglyphics is due to Champollion, the French Egyptologist.

The Rosetta Stone, now in the British Museum, is composed of black basalt. It was found near Rosetta in the Nile Delta, Egypt, in 1799, by a French officer of Napoleon's engineering corps. See illustration on page 222.

ROSE WINDOW. A large, circular window of plain or coloured glass, divided by tracery or bars into compartments, and used in Gothic churches. The name is not due to colour, but to its shape. Where the stone tracery radiates in the form of spokes, the rose window is often called a *wheel window*. Where the voids form the design, it is called *plate tracery*. The decorative rose window was a feature of the church architecture of the thirteenth and fourteenth centuries in France and England, and is also seen to-day in churches of traditional architecture.

ROSEWOOD. The name of several varieties of wood used in making ornamental

furniture and musical instruments. It is also employed as a veneer. Rosewood is valued for the high polish it attains, and for its rich colour, which varies from red-brown to purple, or almost black. The black varieties are often beautifully streaked with red. When the wood is cut or sawn, a slight odour, as of roses, is perceptible, which accounts for the name. The wood comes principally from Jamaica, Brazil, Honduras, India, and Africa.

ROSIN, *roz'in*. Chemically, the residue obtained after distilling crude turpentine, which is the sap of certain species of pine. Rosin is a brownish-yellow solid, resembling a gum in structure and having an odour like that of varnish. It is most extensively employed in the manufacture of varnish, and is also used for hardening laundry soap, in soldering, in the manufacture of sealing wax, and in making some kinds of plaster and cement. Rosin keeps smooth surfaces from being slippery. The name is a modified form of *resin*. See RESINS; TURPENTINE.

ROSS, **SIR JAMES CLARK** (1800-1862). An English explorer, born in London. He entered the navy when 12 years old, and in 1818, and again in 1829-1833, he accompanied his uncle, Sir John Ross, on expeditions in search of the North-West Passage. On the second of these excursions (1831), he distinguished himself by discovering the position of the north magnetic pole. In the interval between these two voyages, he made four Arctic expeditions under Sir William Parry (see PARRY). His most noteworthy service to science, however, was his expedition in 1839 with the *Erebus* and *Terror*, which sailed to the Antarctic. He discovered a great body of land, which he named Victoria Land, several islands, and an active volcano which he called Erebus. The latitude reached by him, 78° 10' S, established a record not broken until 1900. See ANTARCTICA; NORTH-WEST PASSAGE; POLAR EXPLORATION.

ROSS, **JOHN**. See NORTH-WEST PASSAGE; and above.

ROSS, **SIR RONALD** (1857-1932). Distinguished physician and specialist in tropical diseases. Born in India, he returned to that country in the medical service. Closely investigating the theories of malaria



SIR RONALD ROSS
Photo: Fox



EXTRACTING PINE-TREE SAP FOR ROSIN MAKING

Photo: U. & U.

formed by Laveran and Golgi in 1880 and 1885 respectively, he, in 1888, discovered the malarial parasites in blood-cells and showed that micro-organisms of malaria are spread by mosquitoes, later he established the fact that malaria is transmitted by mosquitoes first from bird to bird and then from man to man. Thenceforward the ravages of malaria were minimized. He became K.C.B. in 1911 and K.C.M.G. in 1916. He lectured extensively and wrote a standard book on *The Prevention of Malaria* and published some poems and a novel. His *Memoirs* were issued in 1923.

ROSS AND CROMARTY. A northern county of Scotland, with an area of 1,977,245 acres and a population in 1931 of 62,802. It includes the northern part of the Island of Lewis.

Physical Features and Scenery. Generally Ross and Cromarty forms a mountainous shire with a number of peaks exceeding 3000 ft. in height, whilst the only level land is that on either side of the Cromarty Firth. The remainder is extremely irregular in formation, the western coast indented by a large number of bays and sea lochs, and the

inland scenery diversified by numerous fresh-water lochs.

A high ridge with a mean elevation of nearly 3000 ft. separates the county from Inverness-shire. The highest point is Mna Soul, 3850 ft. On the west the mountains fall with great abruptness to the sea. A more impressive, because more isolated, peak is Ben Wyvis in the north-easterly part of the county, 3430 ft., overlooking the Cromarty Firth. The largest stretch of inland water is Loch Maree toward the west, a famous beauty spot, surrounded by rocky mountains of great height and abruptness. By contrast the Island of Lewis is relatively flat, except in the south-west (in Harris), where an elevation of nearly 2000 ft. close to the sea coast is reached.

The rivers of Ross are mainly of small account, and flow a rapid course either into the Moray Firth or into the westward lochs. In the north the Oykel separates the county from Sutherland, whilst the Orrin, a minor tributary of the Canon, the principal east coast river, rises near the boundary of Inverness-shire and flows east by north into the Cromarty Firth. Glen Orrin surpasses

in beauty many of the more famous glens of the southern highlands, and the Falls of Glomach in Kintail are said to be the highest in Great Britain (more than 350 ft.).

History and Antiquities. The tradition of pre history is perpetuated in several notable monuments. The most remarkable is on Lewis, where the stones of Callernish, near Stornoway, are arranged in the form of a cross. Neolithic in origin, they have been assigned to the Druidical tradition. There are several stone circles in various states of preservation, and many prehistoric hill-top forts, while there is a so-called vitrified fort at Knockfarrel. Nothing is known of the inhabitants in the first centuries B.C. except that they were a race of Picts whose language has disappeared, largely owing to the Gaelic influence of the Scotch kings and of the ecclesiastics of Iona; it is found in many place-names. The Gaelic language is spoken in the county to the present day. Of Roman influence there is no trace, nor is it probable that the Roman legionaries ever penetrated into Ross.

Historical records really commence with the story of Scandinavian invaders. Place-

names such as Dingwall perpetuate their memory. Norse influence was as marked in the west as in the east, though the land-locked bays in the east are known as firths, whilst in the west they are known as lochs. At a later date Ross formed part of the province of Moray, which included much of Inverness-shire, and it is not until the twelfth century that we find mention of a separate earldom of Ross. The county was separately constituted in 1661, being enlarged by amalgamation with Cromarty in 1889.

Agriculture and Industries. The nature of the agriculture is determined by the character of the greater part of the soil. Much of the east, however, is extremely fertile, and the valleys and lower slopes of the hills have been successfully cultivated. The principal crop is, as over most of the north, oats. Barley accounts for most of the remaining acreage. Root crops are grown wherever the land is arable. It is to its sheep and cattle, however, that Ross owes its pastoral fame. The black-faced lambs of the mountain sheepwalks and the sturdy highland cattle of the valleys are alike numerous and valuable. Easter Ross produces high-class



ROSS-SHIRE

Looking down to Loch Broom from the south

Photo Taylor

cattle stock for export, and is one of the principal potato-growing districts in Scotland.

The industries are small, apart from the national occupation of fishing, of which Stornoway remains an important centre. Much profit is derived from the summer influx of holiday-makers, particularly in the towns round Cromarty and Dornoch Firth.

Chief Towns. The county town is *Dingwall*, a Royal Burgh with a population of 2554 in 1931. It takes its name from the Scandinavian Thingvöllr, meaning Parliament Place. Little remains of the former important castle, which was the frontier fort of the Scottish Kingdom in opposition to the Norse. Norse place-names are few south of the Beaul River, once the southern boundary of the County of Ross.

The other Burghs are: *Tain* (population 1383 in 1931), a Royal Burgh situated on the Dornoch Firth and an important market centre for the surrounding agricultural area; *Tain* was once the site of the Shrine of Saint Duthus, and a place of pilgrimage in the days of the later Stuart kings; *Stornoway*, fishing centre and capital of the Island of Lewis (population 3771 in 1931); *Cromarty*, at the eastern end of the Cromarty Firth (population 837 in 1931), a town of Celtic origin, which never had in historic times a Celtic population, and was the capital of the County of Cromarty; *Invergordon*, population 1417 in 1931, on the north shore of the Cromarty Firth; *Fortrose*, a Royal Burgh, population 875, formerly the seat of Bishopric of Ross; it contains the ruins of the cathedral, said to have been demolished by Cromwell to provide stones for his fort at Inverness.

ROSS DEPENDENCY. A section of the uninhabited Antarctic regions, including the Ross Sea, the Great Ice Barrier, and South Victoria Land. The Dependency belongs to Great Britain, and in 1923 was attached to New Zealand for administrative purposes. The Dependency is of economic value only as a breeding-ground for whales. With this acquisition, the British Government claims about one-third of the area around the Pole south of latitude 60° S.

ROSSETTI, ro set' e, CHRISTINA GEORGINA (1830-1894). An English poetess, sister of D. G. Rossetti. She was born in London, educated in her home with her brothers and sisters, and lived a quiet, retiring life. Her interests were two—religion and poetry; and, naturally, her writings show clearly her religious, mystic tendency. They are, however, almost as noteworthy for the delight which they reveal in the simple physical beauty of the world. Some of her short lyrics

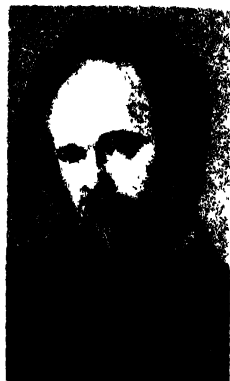
stand among the best things ever produced in English. Most of her best work is contained in *Goblin Market and Other Poems*, *The Prince's Progress*, and *A Pageant and Other Poems*.

ROSSETTI, DANTE GABRIEL (1828-1882). An English poet and painter, one of the prominent leaders in a movement to bring back to painting the purity and simplicity which had characterized it in the Middle Ages. He and his companions in this movement organized the Pre-Raphaelite Brotherhood in 1848, and founded a periodical called *The Germ* for the exposition of their views (see PRE-RAPHAELITES). In this paper was published one of Rossetti's earliest and loveliest poems, *The Blessed Damozel*.

Rossetti was the eldest son of an Italian painter and writer who was exiled for taking part in the revolution of 1820. He was born in London, and was well educated studying at King's College School and at the Royal Academy of Art. Here he came in contact with Sir John Millais and Holman Hunt. The influence of Ford Madox Brown, who became his art teacher when Rossetti was 20, was also far-reaching. Rossetti was married in 1860 to a beautiful girl who furnished the inspiration for the best of his paintings and of his poetry, and when she died, two years after their marriage, his grief was so intense that he placed in her coffin all of his writings then unpublished. In 1870, yielding to the demands of his friends, he permitted these to be exhumed and published. The writings taken from his wife's coffin, a volume entitled *Ballads and Sonnets*, and a series of translations of early Italian poets constitute his entire poetical output. Of his sonnets, the most notable are found in a group of beautiful love poems entitled *The House of Life*. He also wrote *Hand and Soul*, a delicately imaginative story in prose.

Rossetti's paintings are remarkable chiefly for their spiritual quality and mysticism. He found his themes in Biblical subjects, in the life and work of Dante, and in his own imagination.

ROSSINI, ros se' ne, GIOACCHINO ANTONIO (1792-1868). One of the leading composers of Italian lyrical opera. He was born at



DANTE GABRIEL ROSSETTI
Photo: Brown Bros

Pesaro. When 15 years old, he went to Bologna to study music. He was compelled by his teachers to study counterpoint, a subject he disliked, and as soon as he had learnt enough to compose operas, he ceased his work as a student. In after years, his operas revealed some weakness in the technique of composition, but his tunefulness and spontaneity brought him success.

When Rossini was 18 years old he wrote his first opera, *La Cambiale di Matrimonio*. Between 1810 and 1813, he composed five



ROSSINI
Photo: Brown Bros

operas, one of which, *Tancredi*, a story of the Crusades, was a remarkable success, and created wild excitement when produced at Venice (1813). In 1816 and 1817, Rossini had a contract to write two operas each year for a theatre at Milan, and in that period produced such highly popular compositions as *The Barber of Seville* and *Otello*.

During the next five years, he wrote with great rapidity such operas as *Moses in Egypt*, *Jonas*, and *The Lady of the Lake*, the latter based on Scott's famous poem. In 1821 he married, and soon went to Vienna to direct the production of the operas *La Cenerentola* and *Zelmira*.

In 1829 Rossini composed his last opera, *William Tell*. This dignified work is perhaps his masterpiece. Rossini lived for forty years longer, but his creative work was practically at an end. His *Stabat Mater*, a beautiful piece of Church music, is the only outstanding production of this second period.

ROSS-ON-WYE. This Urban District and market town of Herefordshire is a tourist centre on the River Wye, 12 miles from Hereford. It is served by the G.W.R. and had a population of 4738 at the 1931 census. The Wye is one of the five rivers which have their sources in the Welsh mountain Plynlimon. Between Ross and Chepstow it is particularly attractive, its banks having a wide diversity of charm—ancient castles, stately mansions, rocky heights, rich woodlands. The Market House at Ross, dating back to Charles II, contains many ancient relics. Overlooking it is the house once occupied by John Kyrle, known through Pope's poem as "The Man of Ross," renowned for his loyalty to the Stuarts. There is a fine old parish church in which John Kyrle is buried, and which has many his-

torical associations. A few miles from Ross is Goodrich Castle, a mediæval fortress of considerable interest. Ross is remarkable for the low temperatures often experienced there.

ROSTAND, ros' tahN, EDMOND (1869-1918). A French playwright and poet, the son of a prominent journalist; born in Marseilles. Rostand's first play, a comedy in verse, was produced in Paris in 1894, and was immensely successful. Both this and his later plays proved him a skilful dramatist and satirist. Three other plays followed in quick succession, and then came his greatest success, *Cyrano de Bergerac*, an "heroic comedy" in verse, which was produced on 28th December, 1897.

Rostand's most conspicuous success after *Cyrano* was *Chantecler*, a fantasy of bird and animal life. Rostand was elected to the French Academy in 1902.

ROSTOV-ON-DON, ros' tof. See RUSSIA.

ROTARY CLUBS. Organizations of business and professional men, with fellowship and service as their objects. The idea was advanced by Paul P. Harris (born 1868), a Chicago lawyer, who in his loneliness in a large city, to which business interests carried him, determined to sponsor some plan for the promotion of friendships and common interests.

The first club was founded in February, 1905, with a group of four men—a coal dealer, a mining operator, a merchant tailor, and himself. The name "Rotary" was given to the new club because it was planned that the members should meet in rotation at their places of business. At this first meeting it was decided to invite to membership only one man from each business or profession.

Canada and then England endorsed the movement. An international body was formed in 1912.

ROTHERHAM. The County Borough of Rotherham lies in the West Riding of Yorkshire, between Sheffield and Doncaster, and has a population of 69,689. It is served by the L.N.E.R. and the L.M.S.R. and has excellent road transport facilities.

Rotherham is primarily an industrial and commercial town, the coal mines around the boundary being a great factor in its prosperity. Within the boundaries, the heavy metal-working industries are of first importance. The ancient Britons, Romans, and, later on, the monks worked the mineral deposits in and around Rotherham, and these industries have developed to the present day. Railway wagon building and repairing is an important industry, while brass-founding, glass-blowing, pottery manufacture, brewing, and corn-milling employ considerable numbers of the population.

Rotherham's history goes back to Roman



ROTHERHAM CHURCH
Photo: Burrell and Hardman
Courtesy: Rotherham Corporation

times, and there have been many finds of Roman relics. In Domesday Book, the town is mentioned as "Roderham." Coming to later times, the town was the scene of several battles during the Civil War.

The parish church of All Saints is the town's most important ancient building.

ROTHERMERE, HAROLD SYDNEY HARMSWORTH, FIRST VISCOUNT (born 1868). Journalist, publicist and newspaper proprietor. In a remarkable partnership with his late brother, Viscount Northcliffe, the popular national newspapers they created led the way to vast circulations that were undreamed of, except by the two brothers, forty years ago. Their first notable production in periodicals was *Answers*. Then followed the London *Evening News*, the *Daily Mail*, and a vast number of other newspapers throughout the country. During the War, Rothermere acted as Director General of the Army Clothing Department 1916-17, and as President of the Air Council in 1917-18. He has been a liberal patron of education.



LORD ROTHERMERE
Photo: Topical

ROTHERSAY, 10th' se. Royal Burgh and holiday resort, situated on the Island of Bute in the Firth of Clyde. It is an ancient town which obtained its first Charter from



LOCH FAD, ROTHERSAY
Photo: Frith

Robert III in 1400, a privilege which was confirmed by James I in 1584. For a long time it was the principal market town for the island and for much of Argyllshire. Later, in connection with the herring fishery, shipbuilding became established. Further prosperity was assured by flourishing linen mills and by the setting up of cotton-spinning mills, which were the first in Scotland. For fifty years from 1780 this formed the staple industry, but after a gradual decline it disappeared, so that to-day Rothesay is primarily a holiday resort. The castle was built in the eleventh century and is assigned by tradition to Magnus Barefoot, King of Norway. Later it was the residence of many Scottish kings. The population of Rothesay was 9346 in 1931.

ROTHSCHILD (in German, *rot' schild*). A famous family of European bankers, financiers, and philanthropists. The family name was taken from the sign of the house "Zum Rothen Schilde," or "Red Shield," which stood in the Jewish quarter of Frankfurt.

The name was first connected with great financial deals when Mayer Anselm Rothschild (1742-1812), the son of a Jewish merchant of Frankfurt-on-Main, opened a money-exchange house in that city, and in 1806 won favour throughout Germany and Austria by caring for the fortune of the elector of Hesse-Cassel, who had fled from the invading French. Immense sums of the wealth of royalty were henceforward entrusted to him, and before his death, in 1812, he and his five sons had amassed huge fortunes. So conspicuous was the service of these sons that the Emperor of Austria made each a baron in 1822.

The business at Frankfurt passed to the eldest son, Mayer Anselm, and then to the sons of Karl, but upon the death of the youngest of these sons, the Frankfurt house was closed. Solomon, the second son of the founder of the firm, established the famous house at Vienna. His brother Nathan established the British firm at Manchester in 1798, and removed it to London in 1803. Jacob, the fourth son, was founder of the Paris house, and Karl, the youngest, of the one at Naples.

Later noted members of the family include—

Lionel Rothschild (1808-1879), son of Nathan of London, was the main influence leading to Jewish emancipation in Great Britain. Elected five times to Parliament, he refused each time, in taking the oath, to repeat the words "on the true faith of a Christian," and this aroused such discussion that in 1858 the rule requiring the phrase was abolished.

Nathan Mayer, FIRST LORD ROTHSCHILD (1840-1915), the son of Lionel, was born in London and educated at Trinity College, Cambridge. He sat in Parliament from 1865 to 1885, and in the latter year was raised to the peerage. At his death he was president of the British Red Cross.

Lionel Walter (b. 1868), **SECOND LORD ROTHSCHILD**, the eldest son of Nathan Mayer, succeeded to his father's title in 1915, but his interests are more scientific than financial. He was educated at Cambridge, and was a Liberal Unionist Member of Parliament from 1899 to 1910. In 1911 he was elected a Fellow of the Royal Society, and has published several books on zoology.

ROTIF'ERA OR **ROTATO'RIA**. A class of minute animals sometimes called wheel-animalcules, meaning "little wheel-shaped animals." The name is in reference to their having somewhat the form of a wheel, but their appearance of being continually rotating is an illusion produced by fringes of fine hairs, called cilia, which move with a continuous wave motion. Rotifers live in fresh, brackish, or salt water, but they are commonest in stagnant pools where there is thick vegetation. They may even be found among plants in damp places. Some rotifers move about, but a great number are partially sedentary, remaining attached to any vegetable material or to stones. The cilia provide the means of locomotion and also produce a current of water towards the mouth, thus providing a continual supply of very minute food material.

The females are larger than the males, in fact, in some species males have never been found. The place of rotifers in the animal kingdom is very uncertain. For their small size they are comparatively highly developed, and probably come somewhere between the unsegmented and segmented worms.

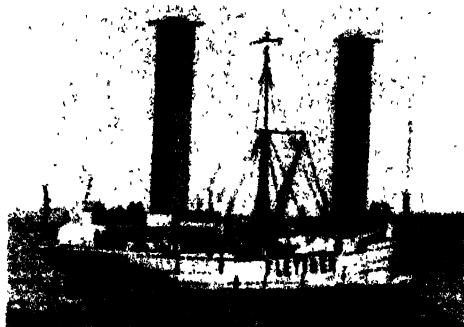
ROTOGRAVURE, *ro to grav' yûr'*. A method of reproducing illustrations by an intaglio process—that is, engraving by means of lines cut below the printing surface. Both explanatory lines of type and the pictures themselves are etched on copper cylinders, and are printed from rolls of paper on rotary presses (whence the name). A special kind of ink is required.

Rotogravure resembles half-tone illustration to a considerable degree, but the former presents a softer-toned picture and the appearance of a glossy finish.

ROTOR. See **DYNAMO**.

ROTOR SHIP. A sea-going vessel propelled by means of the action of air currents upon revolving metal cylinders. It was invented by the German scientist Anton Flettner.

The distinctive feature in the outline



ROTOR SHIP

The first vessel to be equipped with Anton Flettner's invention.

Photo. U. & U.

of a rotor ship is its two huge cylinders of thin sheet steel, placed in the customary position of the masts or smoke funnels. These towers are about 50 ft. high and 10 ft. in diameter, and are fitted with disks of a larger diameter than the cylinder, there being one at each end. The cylinders are placed so as to rotate freely about a central mast, and electromotors make them revolve at a speed of about 125 revolutions per minute. The principle by which the cylinders move the ship is that of the action of an air current upon a revolving cylinder, the effect of which was discovered by Professor Magnus of Berlin in 1853. The strata of air about a revolving cylinder move with the cylinder, diminishing in force as they move outward from it. The air current, or wind, meeting this revolving air, is deflected and rarefied on one side, causing a suction which compresses it on the other side. This pressure produces the force which drives the ship forward at a rate of about six or seven miles an hour.

The rotor ship is a new invention, dating only from 1922, and its complete development cannot be predicted with certainty.

ROTTERDAM. The second largest city of Holland, ranking next to Amsterdam, and one of the most important commercial ports on the Continent. It is situated on both banks of the River Meuse (Maas), 20 miles from the North Sea, and 14 miles south-east of The Hague by rail or canal. In addition to having

an extensive ocean traffic with countries overseas, Rotterdam is a port much used by vessels bound to and from the Rhine provinces of Prussia, for the Meuse is the great highway from the open sea to the Rhine and the countries of South-Central Europe. Its port facilities have been considerably increased since the World War. The people of Rotterdam carry on an extensive trade in



ROTTERDAM

Street scene (above) and the Stadhuys.

Photos: Netherlands Tourist Association

butter, cheese, linen, and flax, and in articles of gold and silver. The city is an important coffee market, and has an extensive transit trade in iron. Population (1935) 597,951.

The chief points of interest include the Church of St. Lawrence, noted for its brazen screen and great organ; and the Boyman's Museum, with a fine collection of pictures and drawings by Dutch masters.

ROUBAIX, *ru bay'*. See FRANCE.

ROUBLE, *ru' b'l*. The standard unit of Russian money, with an original value of about 25. at par. The sub-unit of the rouble was the kopek (100 kopeks = one rouble). After the revolution, chiefly owing to the economic collapse consequent on inflation after the World War, the rouble became of infinitesimal value. In 1922 and 1924 efforts were made to stabilize the currency, and on the latter occasion permanence was assured by limiting the issue of paper currency by reference to the gold backing. The par value of the present rouble is a fraction over 25 '10. A new official value has been given to it (1936), making it equivalent to 4½ francs.

ROUEN. See FRANCE.

ROUGE, *roozh*. Deep-red, powdered ferric oxide obtained by calcining iron sulphate. It is used for polishing glass, stone and metal. The cosmetic known as rouge is French chalk coloured with pigment which may or may not have oil added to it.

ROUGE-ET-NOIR, *roozh eh nuar'*. The French for "red and black." The name of a game of chance much in vogue in Europe. The players arrange themselves about a green-covered table, on which is a diagram showing four divisions upon which money may be placed as a bet. These are *rouge*, *noir*, *couleur*, and *inverse*. Six complete packs of cards are used, each player shuffling a part of the cards, and the banker shuffling them all.

The banker then deals a row of cards (face up) for *noir* until the face value of the cards aggregates or exceeds 31, the court cards counting 10 and aces 1. Then a similar row is dealt for *rouge*. The row which most nearly approaches the number 31 is the winning one, and the players who have staked on the winning colour get double stakes. If the first card turned up in the deal is of the winning colour, *couleur* wins, and if the contrary is true, *inverse* wins. A fresh deal, called a *refait*, is made when the number of spots is the same in each row; that is, in case of a tie. If both count exactly 31, the banker claims one-half of all stakes, a rule which gives him an advantage calculated to be equal to about 1.25 per cent on all sums staked. This game and

roulette were forbidden by law in France in 1838.

ROUGET DE LISLE, *ru' zheh de leel'*. The composer of the Marseillaise (which see).

ROULETTE, *ru let'*. A game of chance, of French origin, played first in the gaming rooms of Monte Carlo.

The roulette table is covered with green cloth, and has a wheel in the centre. The cloth is divided into spaces marked *passee*, *pair*, *manque*, *impair*, and two diamond-shaped spaces coloured black and red. The wheel is divided into 37 compartments, coloured alternately red and black, and numbered, not in sequence, from 1 to 36; there is one with 0. *Pair* indicates even



ROULETTE TABLE AT MONTE CARLO
Photo: Central

numbers, *impair*, odd numbers, *manque* indicates the numbers from 1 to 18 inclusive; *passee*, the numbers from 19 to 36.

As played at Monte Carlo, the minimum stake is five francs. There are innumerable ways of staking, on colour, odd or even numbers, on single numbers, on groups, and many others. At Monte Carlo the *croupier*, whose duty it is to set the wheel revolving and literally rake in the money lost by the players, calls out *Faites votre jeu*, meaning "play," starts the wheel revolving, and throws in the marble. Wagers have been placed. When the wheel begins to stop, and it is seen that the marble or ball will soon fall into a number, he calls *Rien ne va plus*, after which no more stakes can be placed. The *croupier* announces the number, the colour, whether odd or even, or *manque* or *passee*, and pays the winners, and with his miniature rake, gathers in the money lost by betters.

ROUMANIA. See RUMANIA.

ROUNDERS. A game somewhat similar to baseball, played with the same type of hard ball. An elongated bat is employed not more than 35 in. in length, and there

are five bases, including the home base, arranged in the shape of an elongated diamond with sides 22 yds. long. Fourth base is between third and home base. There are ten a side. The bowler stands in the centre of the diamond and tosses the ball to the striker, who may hit it in any direction and must then run to the first base. The aim is to run from base to base until home base is reached again, thus scoring one rounder. Each member of the team bats in each innings, in order, and on returning to the base takes his turn again until all the team are "out" or there is no striker at the home base. Three innings a side complete the match. The batsman may be out by being caught either full pitch or first bounce, or by the wicket-keeper off a ball he has struck at but not hit. He may also be out by being touched with the ball when running between bases. (In the original game, in which a soft ball was used, it was permissible to strike the runner by flinging the ball at him.) The bowler must toss the ball so that it passes immediately over the base mark and between the neck and knee of the striker. The striker is allowed three balls, but if he strikes at the ball but fails to hit it, this counts as a hit and the striker must run to first base. For the ladies' game, in which a smaller bat is used, the bases are arranged in the form of a pentagon.

ROUNDHEADS. The name which was first applied in derision to the members of the Cromwell faction, or Parliamentary party, in England at the outbreak of the Civil War in 1642, because they insisted on having their hair cut close to their heads. Their opponents, the Cavaliers, or Royalists, followers of King Charles I, wore long, flowing curls. See COMMONWEALTH OF ENGLAND.

ROUND TABLE. In the legends of King Arthur, a famous table made by the wizard Merlin, about which the knights of Arthur took their seats, and from which they were named. One seat, the Siege Perilous, was reserved for the man who should be worthy to seek and find the Holy Grail, and was finally awarded to Galahad. The table was made round to symbolize the equality of knighthood, transcending rank and wealth. In recent years the term has been re-applied, in the phrase "Round Table Conference," to denote a meeting at which the delegates have no fixed order of seniority or precedence.

ROUND TOWERS. An interesting form of Christian architecture, dating to the period between the ninth and the twelfth centuries. They are usually built near churches, and they average from 80 to 120 ft. in height. Ireland has considerably over a hundred of these towers, and a few are to be

found in Scotland and other European countries. It is supposed that they were used as places of refuge in times of danger.

ROUSSEAU, *ru' so*, JEAN JACQUES (1712-1778). Rousseau was born of Huguenot parents at Geneva, Switzerland. His mother died when he was so young that he retained no recollection of her, and his education was fragmentary and of little value. When a lad he was apprenticed to an engraver, but at the age of sixteen, he ran away and went to the Duchy of Savoy, where he made the acquaintance of Madame de Warens, a lady of culture, wealth, and refinement. For the next ten years Rousseau spent most of his time in the De Warens' home, where he came in contact with some of the most brilliant intellects of Europe.

In 1741 he went to Paris, where his introduction of a new method of writing music was received with little favour by the Royal Academy of Sciences. He became secretary to the French minister at Venice, but the condescending attitude of his employer wrought upon Rousseau's sensitive nature that he gave up his position and returned to Paris, where he attempted to bring a suit against the Minister.

This was the turning-point in Rousseau's career. He began to give attention to the philosophy of government and to social



ROUND TOWER
At Clonmaine, County
Offaly.

Photo Irish Tourist Association



J. J. ROUSSEAU

conditions, and during the next fifteen years he produced a series of works which revolutionized the thought of Europe. In 1749 he won a prize, offered by the academy of Dijon, by his essay deploring the effect of civilization on morals. This work, the idea of which has been ascribed to Diderot, then his close friend, won him European fame and established for many years the cult of the "noble savage." He published in 1760 his brilliant but high-flown love story *La Nouvelle Héloïse*, and in 1762 *Emile*, theories of education, part excellent, part impracticable, lightly disguised as fiction, and *Le Contrat Social*, a political argument, illogical and unconsciously anarchic but set forth with a convincing eloquence.

As a suspected republican and atheist—he was anti-Christian but probably a deist, not an atheist—he was forced to retire from France to the protection of Frederick II of Prussia and then to England, where he lived from 1766 to 1767. As always, he quarrelled with all his friends, being plagued by a nervous irritability which almost amounted to persecution mania. Rousseau soon returned to France, where he was cared for by various powerful protectors, but never for long by any one of them. At this period he wrote his *Confessions*, a remarkable revelation of his private life and thoughts: his mind was by then obviously unbalanced and his misdeeds may be imaginary.

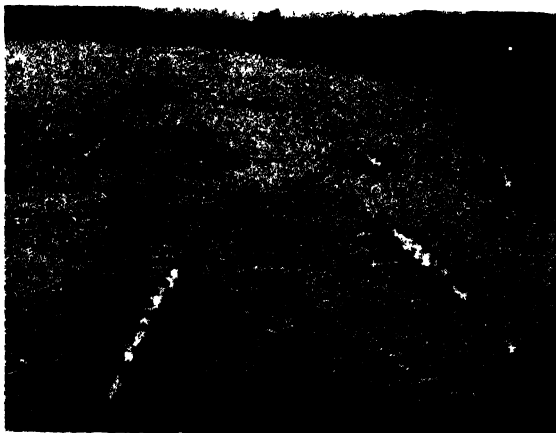
Rousseau was a man of marked contrasts, a character "in whom, probably beyond all others, is to be found the greatest mixture of strength and weakness, of truth and falsity, of that which is attractive and that which is detestable."

His ideas were subsequently adopted by the revolutionaries in France, received with an almost superstitious reverence, and carried to extremes which would undoubtedly have disconcerted him. It has since been realized that he owed his fame far less to his sociological than to his literary powers.

ROWAN, *ro' an*, **TREE**. See **MOUNTAIN ASH**.

ROWING. Rowing has long been one of the most popular forms of athletic pursuit, and the fascination which it exercises is shown by the number of its devotees, when summer pleasures offer, on sea or river; and by the number of crews (over 100) who compete in the Head of the River race annually held on the Thames, and the large entries received for the "Bumping" races at the Universities. There are various types

of boat. There is the popular single skiff, wherein one man is self-employed—with its racing counterpart, the thin-shelled sliding-seat craft with outrigger rowlocks; the double sculler, with two men similarly engaged; the four-oared craft, in which the oars, one allotted to each man, are pulled on alternate sides of the boat; and an eight, plus a coxswain to steer and perform other duties. The eight rowers, as in a four, have



HEAD OF THE RIVER RACE AT PUTNEY

Photo. Photopress

charge of only one oar each and pull on alternate sides.

Much of the popularity of the sport is due to two long-established events, the Oxford v. Cambridge race on the tidal Thames, universally termed the "Boat Race," and the world-famed Henley Regatta. Another most popular rowing event in England is Doggetts Coat and Badge, a race for young Thames watermen, instituted over 200 years ago. The Wingfield (amateur championship) and Diamond Sculls are the most famous single events in the rowing world: it is the ambition of most first-class scullers to win the Diamonds at Henley Regatta, an honour which is commonly regarded as the world's amateur championship. Very little less glamour surrounds the winning of the Goblets (double sculls) and the Grand (eights) at Henley.

ROXBURGH. This border county of Scotland has an area of 426,028 acres and a population (in 1931) of 45,787; it occupies more than 50 miles of the boundary between the two countries.

Physical Features and Scenery. The southern part consists of the Cheviot Hills, many of the highest summits of which lie within the county, though the Cheviot itself is a mile to the east. Nowhere except on the

border along the Cheviots does the elevation exceed 2000 ft., but Cauldcleuch reaches 1996. The highest ground is in fact all in the south and west, and the land falls away northward and eastward to the Valley of the Tweed.

The scenery is that associated with the Southern Uplands, high plateau land with rounded grass-covered knolls rising above

ment of a pitched battle during the Anglo-Saxon period. The Romans had a station at Trimontium.

In the Saxon period and after the Norman Conquest, owing to its geographical position, Roxburgh stood the brunt of most of the fighting between England and Scotland. So we find it alternately held by Strathclyde and Bernicia, and still later, within



KELSO, ROXBURGH. THE BRIDGE ACROSS THE TWEED, AND THE ABBEY

Phot. Taylor

the general level, bare of all vegetation except for the short, close turf.

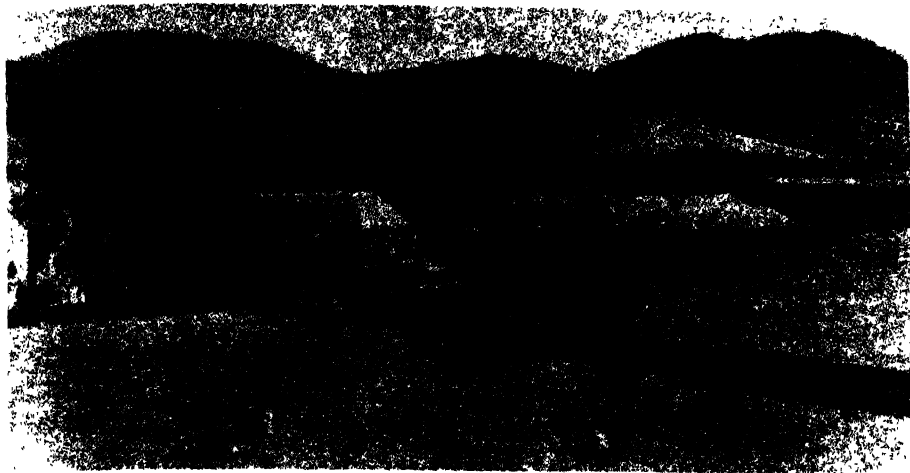
North of the main ridge of hills, toward Melrose, are the three isolated peaks known as the Eildon Hills. The rest of the county comprises chiefly the Valleys of the Tweed and its tributary the Teviot. This is a very fertile country, and is intensively cultivated.

The Teviot is the longest river entirely within the county, with a course of nearly 40 miles.

History and Antiquities. On the Cheviot Hills where the land has never been ploughed, traces of prehistoric inhabitants are plentiful in the form of hill-forts and stone circles. The largest of these latter is Nine Stone Rig, though the theory has been advanced that this is not a true stone circle, but a monu-

ment of the Kingdom of Northumbria. In fact it was not until the eleventh century that it became part of the Scottish nation. It is recorded that it was raised to the status of shire during the reign of David I of Scotland.

It is still rich in medieval antiquities, both castles and abbeys. Jedburgh Abbey, which was founded in the twelfth century by David I, and is still in an excellent state of preservation, has a picturesque position near the banks of the Jed. The castle of Jedburgh has disappeared, but Ferniehirst Castle, the stronghold of the Kerr family, built in the sixteenth century, is a good example of its period. Kelso Abbey is smaller and much restored. Of Branksome Castle one square tower is *in situ*, dating from the earliest days of the Baronetcy of Buccleuch.



FARM IN THE CHEVIOT HILLS, NEAR VETHOLM, ROXBURGH

Photo Taylor

Melrose Abbey is justifiably the most famous in the border counties. It is recorded that an Abbey was founded here in the seventh century, and was re-founded by David I in the twelfth century for monks of the Cistercian Order, of which these were the first representatives in Scotland. Fine



MELROSE ABBEY

Ruins of the monastic building and cloister guth are in the foreground, and beyond is a fragment of the central tower and the monks' choir, of which the roof still remains

Photo Taylor

work of the Decorated Period is still to be seen in choir and transepts.

Agriculture and Industries. There is little waste land in Roxburgh, but, at the same time, only a small proportion is arable, the majority of the whole of the southern part being pasture land and given over to sheep-walks. The Cheviot sheep are world famous for the quality of their wool. Cattle, horses and pigs are also reared in smaller numbers.

The river valleys, particularly that of the Tweed, are the most fertile districts. Here oats and barley are raised with profit, oats occupying more than half of the total land under the plough. There are also a number of orchards, some unusually prolific, in Tweed Dale.

Historically, the wool industry is of chief importance, but this has declined. The manufacture of tweed and hosiery is carried on at Hawick and Jedburgh, and at Jedburgh is a rayon factory. Kelso is the chief market town. Engineering, dyeing and hosiery manufacture are the principal occupations, apart from business carried on in connection with the markets.

Chief Towns. The county town is *Jedburgh*, a Royal Burgh with a population of 3057 in 1931, a town which has been the chief town of the district ever since it was the seat of the Court of Justiciary for administering the Border laws at a time when "Jeddart Justice" became a byword for severity.

The other Burghs are *Hawick* (population 17,059 in 1931), situated on the Teviot and the largest town in the county, *Kelso* (population 3855 in 1931), situated at the junction of the Teviot and Tweed, with its well-preserved Abbey ruins, and *Melrose* (population in 1931, 2053) (see above).

ROYAL AIR FORCE. Balloons were used in the siege of Paris of 1871. The British Army experimented with balloons at Woolwich Arsenal in 1878 and small balloon detachments of the Royal Engineers were sent to Bechuanaland in 1884 and to the Sudan in 1885. In 1890 a regular balloon section was formed as a unit of the Royal

Engineers, and this may be said to have been the nucleus from which the present Royal Air Force sprang.

But the idea of using heavier-than-air craft for military purposes did not come into prominence until later. When a balloon factory was established at South Farnborough in the first years of the twentieth century, the thoughts of tacticians were beginning to turn towards the aeroplane as an instrument of war. In the spring of 1911 these thoughts began to take definite shape, for the balloon company of the Royal Engineers became on that date the Air Battalion of the Royal Engineers and it included one company for aeroplanes. The commander was Major Sir Alexander Bannerman.

While the War Office was examining the possibilities of using aircraft with the Army, the Admiralty was also looking at the Naval side. It interested itself mainly in airships at first, and a special branch was formed at the Admiralty under Captain Murray Sueter to keep in touch with airship development. In 1911, in the same year as that in which the War Office created its Air Battalion, the Admiralty bought two aeroplanes and rented land at Eastchurch to establish a Naval Flying School. In January of the following year the foundations were laid of the present Fleet Air Arm and of the present type of aircraft-carrier, for an aeroplane was flown from the bows of H.M.S. *Africa*.

The stage was now set for government action, and the Prime Minister asked the Committee of Imperial Defence, under Lord Haldane, to consider the possibilities of the further development of naval and military aviation. A scheme for the establishment of a Flying Corps was drawn up, the idea being to group both naval and military machines under it and to form Naval and Military Wings with a Central Flying School capable of undertaking all the training.

April of 1912 saw the Flying Corps constituted by Royal Warrant, the date being the 13th. The King gave his approval of the designation "Royal." On the same date, the 13th April, 1912, the Admiralty formed its Air Department under Captain Murray Sueter. The war establishment of the Royal Flying Corps was to be seven aeroplane squadrons. For more than two years this organization of service aviation was maintained; but then, on the 1st July, 1914, the Royal Naval Air Service was formed, and there came into existence that cleavage between the two sides of service flying which eventually led to disputes and criticisms and finally to the merging of the two services into the Royal Air Force. See **WORLD WAR.**

Creation of the Royal Air Force. As early as 1916 the first administrative move toward the creation of a separate air service was taken, when an Air Board was set up whose duties were mainly those of co-ordination. But it was in 1917, on the 29th November, that the Air Force (Constitution) Act received the Royal Assent. On the third of January, 1918, the Air Council was formed and the Royal Air Force came into being on the 1st April, 1918.

From that time on, Great Britain's defences were the concern of three separate fighting services instead of two. The change had many critics.

Objections were overruled mainly on grounds of supply. Greater economy and efficiency in supply could be secured by the creation of a single Air Ministry and a separate Air Force. Even to-day, however, there are those who believe that Naval and Army needs in the matter of aircraft are not properly attended to under the three-service system and that the Royal Air Force is not in a position to attend to them efficiently. So strong has this feeling become in the Admiralty that the Navy has gradually assumed greater and greater control over sea-going aircraft, and to-day 75 per cent of the personnel of the Fleet Air Arm is composed of naval officers. Even so, the Fleet Air Arm has not been very rapidly developed, if the standard of measurement is the size of the Navy. Consequently further agitations for full Naval control over the Fleet Air Arm may be expected.

Strength of the R.A.F. The strength of the Royal Air Force has fluctuated between wide limits. At the time of the Armistice the Royal Air Force had 30,122 officers and 263,410 men. It had 22,647 aeroplanes and seaplanes and 103 airships. It was stationed at 274 stations abroad and at 401 at home. This was the peak period of R.A.F. strength.

After the war the countries of the world, expecting a period of peace, allowed the strengths of their fighting forces to drop rapidly, but of late years the matter of air defence has again become prominent.

Contrary to the popular belief, the technical development of aircraft was more rapid in peace-time than in the war. There had been advances during the war, but they were mainly the result of increasing the engine power. In the post-war years rapid strides were made in aerodynamics, and the new aeroplanes possessed powers of speed, climb and range far greater than those achieved by war-time machines. Consequently the frontiers of every country in the world were being shifted, almost unknown to the countries themselves.

"Home defence" began to take on a new



ROYAL AIR FORCE ACTIVITIES

1. Observer using a camera-gun. The photographs it takes show whether the target would have been hit.
2. Pilot and gunner of a "Demon" fighter waiting orders to intercept bombing raiders.
3. Bomb racks on a De Havilland machine.
4. A mobile fuel tank, with which three machines can be fuelled at once.
5. Aerial torpedo attack.
6. Taking machine-gun ammunition on board.
7. Machines parading at Hendon aerodrome for the R.A.F. display.

Photos: "The Aeroplane"; Fox, Central

**FORMATION FLYING**

The machines are over Salisbury Plain and Stonehenge can be seen in the foreground.

Photo: Photopress

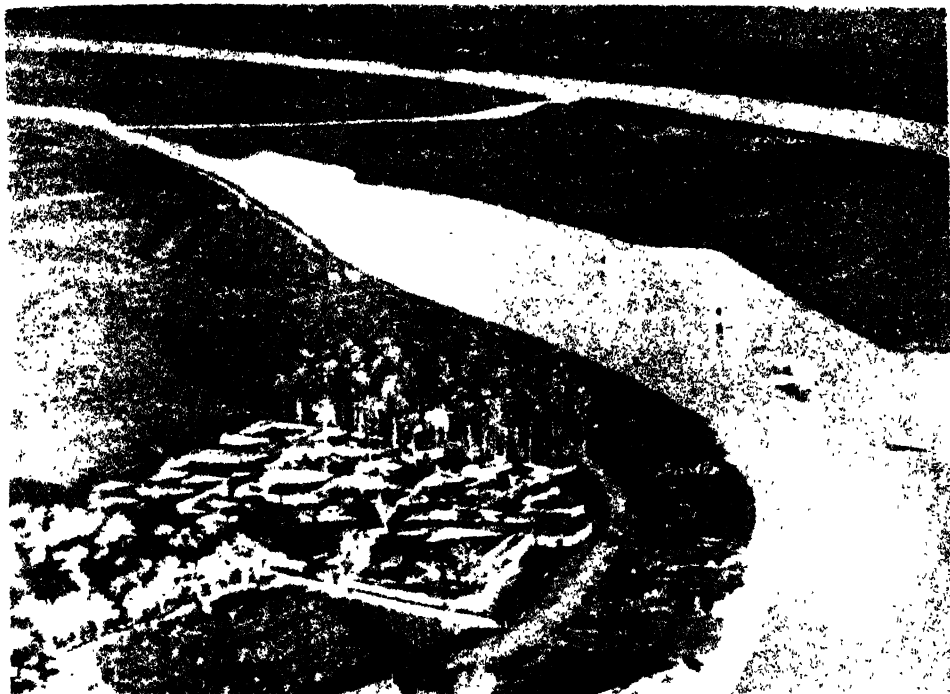
meaning, and the governments, including that of Britain, started to re-examine it. It is impossible to mention all the stages through which the examination went; the outcome was that it was decided in 1923 that fifty-two squadrons were the smallest number that would give adequate home defence. A squadron of the Royal Air Force, it

may here be mentioned, varies in the number of machines according to whether they are single-engined or twin-engined or flying boats. In general it may be taken that a single-engined squadron will have twelve machines and a twin-engined squadron ten; but under war establishment the numbers are increased to twenty and fifteen.

The provision of the 52 home defence squadrons, however, was delayed. While it was held up, foreign air forces began to increase in strength. Eventually in 1934 the number needed was increased from 52 to 75 and then again to 105. By 1936, 120 squadrons were aimed at for the defence of the British Isles, with some 1750 first-line aeroplanes and an additional twelve squadrons overseas. The total number of aircraft which

warning is given that at a certain time the village will be bombed. Plenty of time is allowed to permit the tribesmen to move and to get their women and children away. But the loss of the village is usually sufficient to bring them to obedience.

R.A.F. duties are by no means confined to war work. The training is interesting, and it culminates in the annual Royal Air Force Display, originally called the Pageant,



THE AIR FORCE IN MESOPOTAMIA

Flying boats on the River Tigris

Photo: Royal Air Force Official Crown Copyright Reserved

should be attained at the conclusion of the 1936 expansion programme is about 2000 first line machines, and there would be large immediate and stored reserves.

Air Force Work. While the Royal Air Force has been increasing in size, so have its responsibilities. "Air control" was developed at Aden and in Iraq and on the North-West frontier, and proved to be the most humane and the most efficient method of policing difficult country and of controlling tribesmen ever invented.

The method used to enforce obedience to the law upon a recalcitrant tribe, is first to give it a series of warnings by dropping messages saying what will happen if it fails to obey. If these have no effect a final

at Hendon aerodrome. Here aerobatics, formation drill, instruction, wireless control and other flying duties are illustrated.

One of the greatest occasions in the history of the Royal Air Force was the Jubilee Review and fly-past held for King George V in 1935. The Review was at Mildenhall and the fly-past at Duxford, when the King saw the machines he had inspected in the morning go past in formation.

King Edward VIII in 1936 was the first reigning monarch to conduct a flying inspection of the R.A.F. In his own private aeroplane he visited stations representative of each main branch of R.A.F. work.

Many notable flights have been made by R.A.F. pilots in the course of their duties.

The most remarkable were the flights made in the Schneider Trophy races of 1927, 1929, and 1931, in which years Britain was successful. After the 1931 contest the High Speed Flight, which had been specially constituted for these events, was disbanded. The R.A.F. obtained the altitude record in 1936.

Organization of the R.A.F. The Air Council is the controlling authority; it is presided over by the political head, the Secretary of State for Air, or Air Minister. Under the Secretary of State for Air comes the Under-Secretary, whose special responsibility is civil aviation. Then, in the R.A.F. proper, there is the Chief of the Air Staff, and under him the various Members of the Air Council with their separate departments of the Air Ministry. There are departments for Supply and Research, for Works, Buildings, and Lands; and for every main division of work.

Greatest and best known of the Chiefs of Air Staff is Sir Hugh Trenchard, who was created Baron Trenchard of Wolfeton when he resigned in 1928. Sir Hugh Trenchard built up the Royal Air Force from its beginnings. He was in command of the Royal Flying Corps, succeeding General Henderson to that post, in France in August, 1915. After Sir Hugh Trenchard, Sir John Salmond became Chief of the Air Staff and then his brother, Sir Geoffrey Salmond.

In June, 1936, a drastic change was made in the organization of the R.A.F. The object was to put the service on a war footing and to attempt to improve the administrative efficiency. In brief, the whole of the Air Force was reorganized on a basis of four commands. These are Bomber, Fighter, Coastal and Training Commands. The grouping puts the squadrons together in accordance with their function.

The R.A.F. as a Career. Regular officers for the Royal Air Force go through the Royal Air Force College at Cranwell or through a University. The training is very complete and includes practical flying as well as general and specialized education.

In addition to the regular commissioned service, there are short-service commissions in which the applicant engages for a given period. On leaving he is given a gratuity. There are also the Auxiliary Air Force and the Reserve, but neither of these provides a career.

Boys can enter the Air Force for training as apprentices, and there is direct recruiting of aircraft hands. It is important to remember that in the present Royal Air Force pilots need not be commissioned officers. There are now large numbers of Sergeant pilots.

ROYAL FERN. A handsome fern native to Britain and other parts of the world. In a humid situation it often reaches 7 ft. The greenish clusters of sporangia resemble flowers.

Scientific Name. *Osmunda regalis*.

ROYAL HOUSEHOLD OF GREAT BRITAIN. The personal attendants upon the reigning sovereign. The head of the royal household is the lord steward. Under him are the treasurer, the controller, the master of the household, and various officers and servants. Included also in the royal household are the officers of the chapel, the chamber, and the stable. The attendants of the queen are headed by the mistress of the robes, under whom are the ladies of the bedchamber, maids of honour, and other attendants. The queen's personal attendants are the ladies of the bedchamber.

ROYAL INSTITUTION. A scientific society founded in England in 1799 and chartered in the following year. Its object is to encourage research and spread knowledge. Many brilliant scientists have been connected with the Institution, including Thome Young, who established the wave-motion theory of light; Sir Humphry Davy, the inventor of the safety lamp for use in mines; Michael Faraday, John Tyndall, Sir E. Lankester, and Lord Rayleigh, who, in conjunction with Sir William Ramsay, discovered the element argon.

ROYAL SOCIETY, THE. The oldest scientific society in Great Britain and the most famous in the world. The full title is *The Royal Society of London for Improving Natural Knowledge*. Its members are called "fellows," and they are entitled to the designation F.R.S. The organization was incorporated with the sanction of Charles II in 1662, but there was an informal Society as early as 1645.

In 1664 it began the publication of its famous *Transactions*, which form by far the most valuable record of scientific achievement in existence.

In 1671, the year Sir Isaac Newton was elected a Fellow, the association was appointed to direct the Royal Observatory at Greenwich, and this work was followed by such undertakings as the correcting of the calendar in 1752, the protection of British ships from lightning, the Antarctic expedition of Captain Cook in 1772, the Arctic expeditions under Parry in 1819, Sir John Franklin in 1845, and Nares in 1875, and, more recently, the determination of the density of the earth, with other noteworthy enterprises.

ROYALTY. A species of rent payable by a person to whom some valuable right is granted, and varying with the profits earned

by exploiting the right commercially. There are two connections in which the word "royalty" is commonly used, namely (a) the publication of literary, dramatic, and musical works, and (b) the mining of coal and other minerals. Authors sometimes sell the copyright of their works outright to the publisher (this procedure, however, is not to be advised); or they may employ a publisher to publish their works at a commission. But the method now usual is an agreement under which the publisher is to pay the author a royalty of so much per cent on the trade price of each copy sold. In the case of dramatic works, royalties are reserved by the author in granting performing rights or cinema rights. Royalties on performing rights are usually calculated on the gross receipts for admission, but sometimes on the number of performances given; in a grant of cinema rights, the royalty is usually a percentage of the price of all films sold by the producer in which the scenario is used, and of the rent charged by the producer for the hire of all such films. With mines, the usual practice is that the owner of the mine grants a lease to some person or company willing to work it. The lessee pays a small fixed rent (known as a "dead rent") and in addition a royalty rent, varying with the amount of coal obtained from the mine. The calculation of the amount of coal worked is either in tons or in acres, for the latter purpose, a standard thickness of 1 ft. is taken, and the royalty is increased or diminished according as the thickness of coal is greater or less than 1 ft. Legislation for the unification of mining royalties is proposed.

RUANDA and URUNDI. A district in Central Africa that formerly was part of German East Africa and since 1919 has been ceded to Belgium under a mandate of the League of Nations and is now administered with the Belgian Congo. The total area is 20,535 sq miles and the negro population about 3,276,000. There are a few hundred Europeans. Cattle breeding is the chief occupation. Usumbura is the centre of administration.

RUBAIYAT, *ru bi yahi'*. An Arabic word, used to designate any collection of quatrains, or four-line stanzas. In English it is applied to Omar Khayyam's poem in quatrains, translated by Edward Fitzgerald.

RUBBER. A substance of vegetable origin. The raw material is a mixture of resins, hydrocarbons, water and other substances, the product differing in its characteristics according to the plant from which it is derived and the preparation. It is found in the milky juice, or latex, of various trees, shrubs, and plants that grow chiefly in hot countries. Latex is not a true sap, but

is secreted in the inner layers of bark, and oozes out, drop by drop, through cuts made in the bark of plants possessing it. The fluid, in fact, is poured out to heal the wounds. When a quantity of latex is collected and allowed to stand, the tiny globules of rubber rise, leaving a watery liquid beneath. This top deposit is crude rubber.

How Rubber Came to be Known. The story of rubber begins with the conquest of America by the Spaniards, who noticed that



TAPPING FOR RUBBER. HALF SPIRAL CUT
Photo: India Rubber Journal

the natives used the hardened juice of certain trees for many purposes, and at a later date they employed this material to waterproof their garments. In 1735 La Coudamine, a French botanist, introduced crude rubber or *caoutchouc* into Europe, and in 1770 Dr Priestley referred to it in his writings as being of use for erasing pencil marks on paper. Twenty years later, attempts were made to use rubber for waterproofing cloth, but these were not satisfactory until Charles Macintosh brought out his process in 1823. A further step was made about 1836, when Hancock in England and Goodyear in America discovered the process of *vulcanization*, by which rubber, when heated with sulphur, lost its adhesiveness and increased its elasticity and pliability. A further treatment produced a hard substance known as *ebonite* or *vulcanite*.

Sources of Crude Rubber. Most of the rubber of commerce is derived from the hevea tree (*Hevea brasiliensis*), a plant belonging to the spurge family and native to South America. Also abundant in Brazil is a species of *Manihot*, plantations of which have been established in Africa, India, and Ceylon. From Colombia, Ecuador, and Central America comes a rubber derived from a species of *Castilloa*. Tropical Africa is the home of various creeping shrubs



CHINESE TAPPER AT WORK
Photo Guthrie and Co Ltd

(*Landolphia*) that furnish a marketable product, including Congo, Madagascar, and other types of rubber. The guayule plant, abundant in Mexico and Central America, and also grown in California, furnishes a rubber substitute contained in the bark and wood in solid form.

When the vulcanizing process gave new impetus to the production of rubber, the industry developed on a large scale in Brazil. No attempt was made to cultivate the trees on plantations, but an Englishman, Henry Wickham, sent 70,000 seeds to Kew Gardens. Here they were planted, and in August, 1876, several thousand vigorous seedlings were on their way to Ceylon. Four years later, the first trees were tapped, and cultivated rubber had become a product of Asia. When the motor industry began making its extraordinary demands on the world's rub-

ber output, plantations of *Hevea brasiliensis* were established in the Straits Settlements, the Federated Malay States, Java, Sumatra, and Borneo. These regions now produce over 90 per cent of the world's output of crude rubber.

How Crude Rubber is Obtained. Latex is obtained from the trees by tapping; that is, grooves are cut in the bark and the juice is collected in cups. On modern plantations, regularly on every second day the tapper revisits a tree to widen the grooves and expose new surfaces for the flow of the juice. On the plantations, care is taken not to injure the wood, and only a part of any tree is uncovered in one season. With these methods, the trees cover the raw surfaces with new bark, and in some cases, the plants go on bearing for thirty years and more.

Tapping is done in early morning, before the sun is hot enough to harden the latex, and check its flow. It ordinarily runs (actually, drop by drop) for an hour after the cut has been made. Then the contents of the cups are poured into cans, and the product is taken to a central station for coagulation. In the old days, the rubber gatherer of the Amazon jungles would dip a wooden paddle into the juice and hold it over a smouldering fire of leaves and nuts until the liquid had evaporated and a film of rubber was left on the paddle. From repeated dippings were formed the large black balls, or "biscuits," of crude rubber that made their way to foreign markets under the name of *Para rubber*, so called because shipped from the city of Para.

On most of the Asiatic plantation, the collected latex is poured into vats containing an equal volume of water, and the rubber is coagulated by the action of dilute acetic acid. The rubber particles form thick, dough-like sheets that are put through several processes of squeezing between rollers, washing, and drying, variations in the methods giving sheets of different colour, elasticity, etc. These are known as *smoked sheet*, *pale crepe*, *amber blanket crepe*, and the like.

Although the coagulation method described above is a vast improvement over the old Brazilian system, it does not insure absolute purity or uniformity of product, and a still more advanced method, called the *spraying process*, has been adopted on large plantations in the East Indies. The latex, poured into a huge steel tank, is allowed to trickle down through a pipe upon a rapidly revolving disc, which throws off the liquid in a fine white mist. The rubber particles, dried instantly by inflowing heated air, settle like snowflakes on immense trays mounted on castors, which are wheeled

away as they become full. So terrific is the speed of the disc that the "flakes" accumulate at the rate of about 600 lb. per hour. This sprayed product is free from acids and impurities, is uniform in quality, and has great tensile strength.

Rubber Manufacture. The manifold products derived from rubber cannot all be made from the same raw material, for these pro-

a uniform mixture. The batch comes out of the mixing mills in the form of a flat sheet about a quarter of an inch thick. This is cut off into slabs measuring about 3 ft. by 6 ft., which are placed in racks to cool.

Some articles are formed and vulcanized in metal moulds, and some are fashioned before they are subjected to the final heating, or "curing," process.



A RUBBER ESTATE

ducts must have varying degrees of hardness, stiffness, elasticity, resistance to pressure and blows, to oils and acids, to changes of temperature, and so on. Such qualities are imparted by the addition of different ingredients called *fillers*; by mixing raw rubber with certain fillers before vulcanization, the manufacturer is able to secure just the compound he needs for any particular product. The materials used include, besides sulphur, such substances as zinc oxide, chalk, mineral dyes, china clay, etc.

When the pure rubber has been reduced to a plastic mass, the other materials are poured in, and the batch is passed through a set of hot rollers until the ingredients form

The Uses of Rubber. Travel and transport have been revolutionized since the invention of rubber tyres and the use of rubber in other parts of vehicles. It has become indispensable in telegraphy and the various kinds of electrical and wireless apparatus. We meet with rubber products in wearing apparel, footgear and floor coverings, and as vulcanite and ebonite in innumerable small articles.

The surgeon cannot get along without it, nor can the miner, the chemist, or the manufacturer.

Production. During the decade following 1910, the world's production of crude rubber more than quadrupled. In 1910 about 90

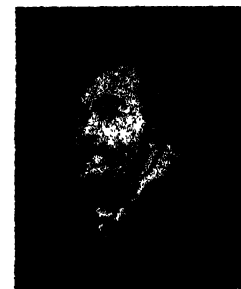
per cent of the yield was wild rubber, at the beginning of the World War, about half of the output was plantation rubber; and plantation rubber, chiefly from Malaya, Ceylon, and the Dutch East Indies, was 92 per cent of the total by 1921. Production in 1935 reached about 1,000,000 tons, including 280,000 tons of reclaimed rubber. Rubber planting has become very largely a British industry, as most of the plantations lie within the British Empire and a large amount of British capital is invested in foreign estates. 470,000 tons came from British Malaya in 1935.

In 1922, when a falling rubber market threatened the Far East rubber-growers with bankruptcy, the industry adopted a system of restricting exports, whereby the amount of product to be exported was regulated by the price. Excess shipments were subjected to heavy, graded taxes. The effect of the restrictions was to keep the price of rubber high, and this policy continued until 1928. The price of rubber however has fluctuated considerably, and at the present time the rising cost of production still presents a problem yet to be solved. A new Rubber Exchange was opened in London early in 1936 as a centre for world dealings in this commodity. Some progress has been made in the manufacture of synthetic rubber. See CHEMISTRY, INDUSTRIAL.

RUBENS, *ru' benz*, PETER PAUL (1577–1640). A celebrated painter of the Flemish school, born at Siegen, a town of Westphalia, Germany.

Rubens stands pre-eminent as a master of composition and was also noted for his realism and his use of warm and luminous colour.

In 1600, after studying in Antwerp, Rubens went to Italy, entering the service of the Duke of Mantua. At this period of his life he became acquainted with



RUBENS
Photo: Brown Bros

Titian's masterpieces, and he also studied Paul Veronese and Michelangelo, whose influence can be traced in his later work. In 1609 he was appointed court painter to the Archduke Albert; the same year he painted his "Adoration of the Magi," and between 1611 and 1614, his masterpiece, "The Descent from the Cross," which hangs in the old Notre Dame Cathedral of Antwerp.

In 1622 Rubens was invited by Maria de' Medici, mother of Louis XIII of France, to

paint for the gallery of the Luxembourg at Paris a series of allegorical pictures illustrating twenty-four scenes from her life. In 1628 he was sent on a diplomatic mission to Philip IV of Spain, and the following year was appointed envoy to Charles I of England to assist in private negotiations for a peace between Spain and England. For the success of his mission, he was knighted by Charles I. Philip IV conferred a similar honour upon him.

Having wearied of an ambassador's life, Rubens returned to Antwerp. Some of his best works belong to these later years, notably "The Holy Family of St. George," "The Crucifixion of St. Peter," and "The Flight into Egypt." Sir Joshua Reynolds called him "the greatest master in the mechanical part of the art; the best workman with his tools that ever used a pencil."

RUBICON, *ru' bik on*. A small river of Italy. In the year 49 B.C., while Julius Caesar was in command of the legions in Gaul, a decree was passed by the Senate ordering him to disband his army. In defiance of this command, he led a band of veterans across the boundary between Hither Gaul and Italy—the River Rubicon—and marched on Rome. The Rubicon has not been identified with certainty, but recent Italian studies indicate that the present Fiumicino is the ancient Rubicon.

RUBIDIUM, *ru bid' ium*. See CHEMISTRY (Table of Elements).

RUBINSTEIN, *ru' bin stine*, ANTON GREGOROVICH (1829–1894). A Russian musician who attained lasting fame as a pianist. He was born at Wechwoytynecz, Russia. His mother and a Russian teacher named Alexander Villoing gave him practically all the musical training he ever received, although for a short time in 1840 he attended the Paris Conservatoire. Liszt and Chopin became his close friends and genuine admirers, and under their advice, he received some instruction in composition from great teachers in Berlin.

In 1858 he was appointed director of the Royal Russian Musical Society, and four years later founded the famous Conservatorium of St. Petersburg.

Rubinstein was a supreme master of piano-playing. As a composer, he does not reach so high a level. His operas lack dramatic power, and his pieces for the orchestra and piano fall short of sustained greatness, though they have many beautiful passages. His principal compositions include the *Ocean Symphony* and *Dramatic Symphony*, the operas *Nero* and *The Demon*; the oratorios *Paradise Lost* and *Christus*; and the piano compositions *Melody in F* and *Kaminoi Ostrow*.

RUBY. A transparent variety of corundum. The ruby occurs in shades of red from deep scarlet to pale rose, but the most valuable are those having the colour of a pigeon's blood. True, or *Oriental*, rubies are found chiefly in Burma, Ceylon, and Siam. Pigeon-blood stones come principally from Burma, pomegranate-red from Ceylon, and garnet-hued from Siam. An Oriental ruby of good colour, free from flaws, is worth several times as much as a diamond of the same size.

The so-called *Cape*, *Australian*, and *Arizona rubies* are in reality fine garnets, and the *Siberian ruby* is red tourmaline. *Spinel rubies* are transparent red crystals of magnesium aluminate.

According to the lore of precious stones, the ruby is the birth-stone for July, and the symbol for the fortieth wedding anniversary. See GEMS.

RUDD. A close relative of the roach, the rudd is similar in habit but is distinguished by the fact that it is more local in distribution and, on the whole, by no means as common. It is, moreover, inclined to feed nearer to the surface than the roach. Rudd



RUDD
Photo: Weller

are fonder of lakes than of flowing water. They are common in Ireland, where the roach is seldom found.

Scientific Name. *Leuciscus crythrophthalmus*.

RUDDER. A part of a ship's steering mechanism. See SHIP.

RUDE, FRANÇOIS (1784-1855). A French sculptor of the classical and realist school. Among his finest achievements are *Mercury Fastening his Sandal*, *Neapolitan Fisher-Boy*, and *Joan of Arc*, all of which are in the Louvre, and the monument to *Godefroy Cavaignac*, at Montmartre. *Le Départ* is considered to be his greatest production. It was executed for the Arc de Triomphe, and represents the departure of volunteers from Paris in 1792.

RUDOLF, LAKE. A long, narrow lake in equatorial Africa, 190 miles by 20, and 3500 sq miles in area, lying between Uganda and

Kenya Colony and Protectorate, and touching the southern boundary of Ethiopia (Abyssinia). Lake Rudolf was discovered by Count Teleki in 1885.

RUDOLF(PH). The name of three German rulers or Emperors.

Rudolf, DUKE OF SWABIA (d. 1080). After the death of the Emperor Henry III in 1056 his widow Agnes granted Swabia to Rudolf of Rheinfelden. In 1059 he married Matilda, sister to the young Emperor Henry IV (see HENRY IV) and was put in charge of Burgundy. When Henry was excommunicated he was declared deposed, and Rudolf was elected as King of Germany. Rudolf, with Saxon aid, twice defeated the Imperialists, but Henry, who had made peace with the Pope at Canossa, began steadily to prevail until in 1080 he again quarrelled with Gregory VII, who again declared him deposed and Rudolf to be king as vassal of the Holy See. Rudolf was killed in the same year at the indecisive battle of Hohenmölsen.

Rudolph I, COUNT OF HAPSBURG (1218-1291) and **EMPEROR OF GERMANY**. The founder of the royal house of Austria. Born at Limburg, he succeeded in 1239, on the death of his father Albert IV, to the family estates at Aargau in southern Swabia. Though the Hapsburgs were originally not one of the great princely houses in Germany, they acquired by marriage a considerable dominion, and finally Rudolph, the lord of Swabia, was chosen Emperor by the seven electors in 1273, though he was never crowned in Rome. Thus the Great Interregnum which had lasted since 1254 came to an end. He succeeded in breaking the power of Ottokar of Bohemia, who had annexed Austria and Styria, and then in 1282 bestowed these duchies on his son Albert, who afterwards became king. Albert was thus the ancestor of all the later Dukes, Kings and Emperors of Austria. See HAPSBURGS.

Rudolph II (1552-1612), **HOLY ROMAN EMPEROR AND KING OF BOHEMIA AND HUNGARY**, was born in Vienna to the Emperor Maximilian II and Mary of Austria. During his younger years, he was a great patron of art and culture and did much to adorn his capital city of Prague. But his mental powers weakened and he became increasingly a recluse and a bigot, and reversed the liberal attitude of his father in matters of religious toleration. Indolent and unstable, Rudolph had neither the strength of will nor the courage to control his ministers. In 1609 the Protestants of Bohemia won a charter of toleration and freedom of conscience, and two years later forced Rudolph to abdicate in favour of his brother Matthias. Shortly after, Rudolph died at Prague.

RUE. A perennial herb (*Ruta graveolens*) sometimes grown for seasoning and for medicinal purposes. For Meadow Rue, see that title.

RUFF. A male bird whose mate is known as a Reeve. The male is larger than the female, but in general size and appearance is very like a sandpiper, to which these birds



MARKET PLACE, RUGBY

Photo - Frith

are closely related. The Ruff, as its name implies, has, only in the mating season, a large collar of curled feathers which can be erected and is used for display purposes.

At one time the Ruff bred quite commonly in the marshy districts of England, but with the drainage of these areas it has disappeared and is now only seen at migration periods when moving from the breeding areas in north-west Europe to winter quarters in North Africa.

Scientific Name. The ruff is *Machetes pugna*.

RUFUS. The family name of two Roman statesmen eminent during the latter days of the Republic.

Marcus Caelius Rufus was praetor in 48-47, immediately after Caesar had gained control of Rome. During the absence of the latter from the city, Rufus made a bid for popular support by proposing the cancellation of debts. His proposal was rejected, and he was deprived of his office by the Senate. Rufus armed a large body of slaves and outlaws, with the intention of expelling the Senate and effecting a coup. The revolution proved abortive, and Rufus, with the other ring leaders, was put to death.

Rutilius Rufus was legate to Quintus Mucius Scaevola, proconsul of Asia in 95 B.C., and was distinguished for the fairness with which he administered his office, and for the measures which he adopted for preventing extortion by the equestrian tax-gatherers. In spite of, or rather because of, his reputation for justice he was arraigned on charges of maladministration before the equestrian-controlled courts.

The case was of special importance in that it was the immediate forerunner of the judicial reforms proposed by Livius Drusus in 91 B.C., as a result of which the equites lost their power over the jury courts.

RUFUS, WILLIAM. See WILLIAM II (England).

RUGBY. Situated as it is in Warwickshire, the Borough of Rugby is in the centre of England, 82 miles from London, 30 miles from Birmingham, and 100 miles from Manchester.

It is the centre of an extensive agricultural district, and is the most important market town in the Midlands, but the town is chiefly dependant on the electrical industry. There is a very important railway junction, eight lines radiating from the town and giving direct access to all parts of the country. The Grand Union Canal passes through the town, and there are in close proximity main arterial roads running north, south, east, and west. The population (1931) is 23,824.

In ancient times Rugby was a small fortified place, and it is on a high plateau situated between two great Roman roads, the Watling Street and the Iosse Way. It is mentioned under the old name of Rochberie in the Domesday Book, and it continued to bear that name until the reign of Henry VIII, when the present name was first used. The name Rokeby or Rookby was, however, commonly used for some centuries afterward.

The gradual increase in the size and importance of Rugby began with the growth of Rugby School, but the principal reason for its growth was the coming of the railway.



SCHOOL HOUSE, RUGBY

Photo - Frith

and the electrical engineering works of the English Electric Company, and later the works of the British Thomson-Houston Co.

The town contains within its boundaries extensive engineering, electrical, railway and cement works, and factories making building materials. It is seldom referred to in the history of England.

Rugby School. Founded in 1567, Rugby School moved to its present site in 1750. In 1828, when Thomas Arnold became headmaster, he wrought changes that in a few years extended to all the leading schools in the country. He did not revolutionize existing systems so much as humanize them. He impressed his blameless life and strong personality upon every phase of the school's activities; he trusted the boys, and made the upper classmen responsible for their own conduct and that of the boys in the lower forms. He emphasized the value of a religious and moral life, and directed all the energies of the school to the building of character.

RUGBY FOOTBALL. See FOOTBALL.

RUGS. See CARPETS AND RUGS.

RUHR, roor, THE. This important coal and iron district of Germany takes its name from the River Ruhr, a tributary of the Rhine. In 1921 part of this region was occupied by French troops, after Germany had refused agreement to the terms of the Paris Conference. In 1922 the Reparation Commission declared Germany to be intentionally in default with payments, and early in 1923 the Ruhr mines were taken over by French and Belgian engineers, supported by military detachments. The Germans resorted

to passive resistance and stopped reparation payments in coal and coke. The French did all they could in return to exploit the occupied territory. Much bitterness resulted and the economic results were disastrous. In the following September, Herr Stresemann, then in control of the German Government, ended passive resistance. The founding of the Dawes Committee on Reparations eased the situation, and in 1925 the occupying troops were withdrawn.

RUISDAEL. See RUYSDAEL.

RUM. A strong alcoholic drink, produced mainly from molasses. The liquor is made by the fermenting and distilling of molasses and the by-products of the manufacture of cane sugar. When first produced, rum is white and transparent, but is given a dark-brown colour by the addition of caramel and by being stored in casks that have contained sherry. Its strength and flavour increase with age. The finest quality is produced in Jamaica. It is exceedingly intoxicating, containing sometimes as much as 82 per cent of alcohol.

RUMANIA. A kingdom in the south-east of Europe, which gained its independence from Turkey by the Treaty of Berlin after the Russo-Turkish War of 1877-1878.

In 1914 the country had an area of 53,489



IN THE RUHR VALLEY
(Photo: German State Railways)

sq. miles; after the World War, by cessions, this was increased to 122,282 sq. miles.

The People. Before the outbreak of war, Rumania had a population of 7,508,000. In 1935 the population was



PEASANT OF THE DOBRUJA
(Courtesy: Rumanian Legation)

19,033,363. There were in the country about 834,000 Jews and 200,000 gypsies, besides a great number of Bulgarians, Serbs, Germans, Hungarians or Magyars, Turks, and Armenians. The Rumanians speak a Romance language. Over four-fifths of the people are peasants, and their chief occupation is agriculture. In 1919 a land-reform measure was passed which provided for the division of the large estates into small farms for the peasantry. This law gradually transformed Rumania into a land of small farms and brought a greater degree of prosperity.

Principal Cities. Bucharest, the capital city, is treated in a separate article; the other most important cities are—

Cernauti, formerly *Csernowitz*, capital of the Austrian province of Bucovina, is a town of commercial importance, with manufacturing of machinery, oil, and lumber, and many breweries. The city possesses a flourishing university. It was captured by the Russians in 1914, lost by them to the German-Austrian forces later, and again taken by the Tsar's army in the summer of 1916.

The city is the chief export centre for the products of the province of Bucovina. Population 111,122 (1935).

Cluj, formerly *Klausenburg*, once a free royal town of Hungary and capital of Transylvania, consists of an inner town and five suburbs. The trade includes the manufacture and export of cigars, beet-sugar, and paper. The city has a university. Population, 99,457 (1935).

Chisinau, formerly *Kishinev*, the capital of the rich agricultural province of Bessarabia, lies on the River Byk, a branch of the Dniester. Chisinau has two sections—the Old Town, with its shabby buildings and unpaved streets, and the New, built on high crags above the river. Industrially, the town is known for its production of tobacco, tallow, grain, wool, soap and flour. Population, 115,615 (1935).

Constanza, with a population of 59,607, is the chief seaport and has rail connection with Bucharest over the great *Cernavoda* bridge.

Jassy has a population of 162,705 and **Galati** (*Galatz*) 101,148.

Physical Features and Climate. The Carpathian Mountains and their prolongation, the Transylvanian Alps, form the most striking physical feature of the country. They contain a number of rugged peaks 8000 ft. high, and present in several places fine mountain scenery. These mountains are usually covered with dense forests of fir and pines. Spurs of the Carpathians extend into the country for short distances, and then the ground slopes gradually through a series of hills to the extensive plains of



OUTSIDE THE VILLAGE CHURCH
The ceremony is that of Churaching
(Courtesy: Rumanian Legation)

the Danube (Wallachia) and of the Dniester Prut and Siret (Moldavia and Bessarabia). This territory east and south of the mountain ranges, excepting Bessarabia, was Rumania until the additions in 1919, was



RUMANIAN PEASANT TYPES

1. Peasants gossiping after mass. 2. Peasants of Bucovina. 3. Young peasant girl from Lupeni in the south-west of Transylvania. 4. Woman of Muntenia. 5. A market in Bucharest; note how the fowls are carried. 6. Peasants of the mountains making rugs. 7. Peasants of Poiana in native costume. 8. Blowing horns to call home the cattle in the Transylvanian Alps.

Courtesy: Rumanian Legation

of the Transylvanian Alps, Rumania, now includes the plateau of Transylvania, which slopes westward to the plains of Hungary, across which the frontier is drawn. The land is well watered by several rivers which run southward and westward and flow into the Danube and Tisa respectively.

The climate is subject to great extremes of temperature. The winters are bitterly cold, the plains being swept by cold winds blowing from the steppes of Russia. The whole country lies beneath a thick mantle of snow for several months. The summers are very hot, the thermometer rising sometimes to over 100° F. in the shade. The rainfall is moderate and falls chiefly in summer, and the country suffers sometimes from droughts.

Natural Resources. Agriculture.

Rumania is a very fertile country, its extensive plains being covered with a deep layer of rich, black soil, formed chiefly of loess or alluvial deposits. Over one-third of the total area is arable land. Maize, which forms the staple food of the people, is the chief crop, next in importance comes wheat. Neither is scientifically grown, and modern methods could greatly increase the crops.

Modern machinery is being introduced by the co-operative societies, which are now being organized in great numbers. Seeds as well as machinery are furnished the peasants by these rural societies, and aid is given them in the marketing of their surplus. Other grains raised in large quantities are oats, barley, and rye. Over a million acres are occupied by vineyards and orchards, and large quantities of grapes and all kinds

of fruit are grown. There are many pigs, cattle, sheep, and horses.

In its extensive forests, Rumania has another important source of wealth. The chief trees are oak, beech, pine, fir, elm, willow and walnut.

Minerals. The country is rich in mineral resources. In the foothills of the Carpathians are found extensive oil basins. Rumania

occupies the fourth place among the oil-producing countries of the world. The production of petroleum reached 8,384,000 tons in 1935. Pipelines connect the principal oilfield with Constantza on the Black Sea, and Braila on the Danube.

In the foothills of the Carpathians are also found extensive deposits of rock salt, the extraction of which is a government monopoly. Other minerals found here are coal (high quality), iron, copper, silver and gold.

Natural gas is another important resource.

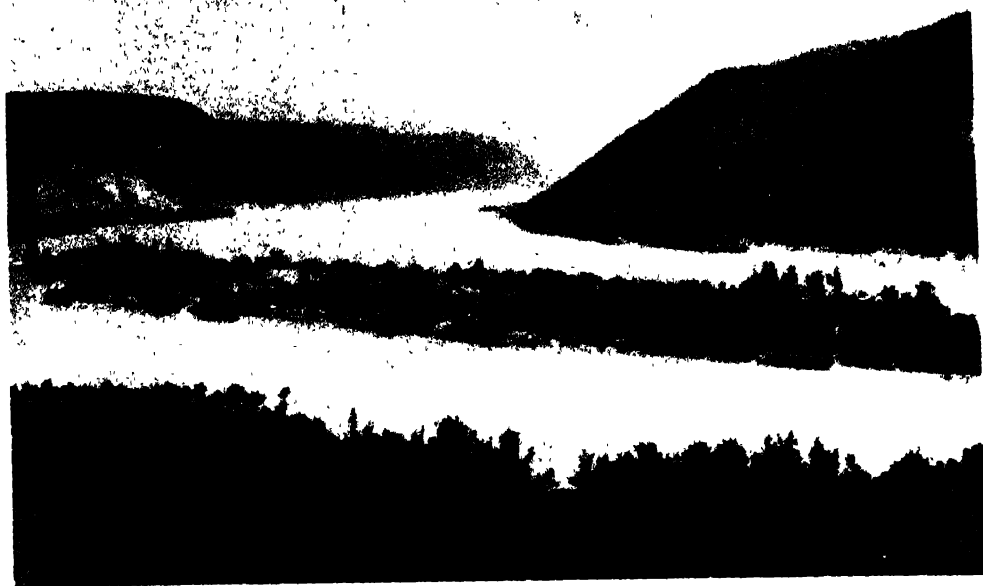
Commerce and Industry. The principal manufacturing industries of Rumania are

flour-milling, brewing, distilling, and, in recent times, iron and steel foundries. Cereals—wheat, maize, and other grains—rank first on the list of exports, followed by petroleum products and timber; of lesser importance are hides, wool, wood manufactures, and fruits. The greater part of Rumania's imports come from the cities along the Danube, and they consist principally of yarns and textile goods, machines and vehicles, manufactured metals, and clothes.

The River Danube serves as an important artery of trade, and the state operates the navigation service. The Danube is frozen



SCENERY BELOW THE PEAKS OF BUCUR
(Courtesy, Rumanian Legation)



RUMANIA'S MAIN ARTERY OF TRADE: THE DANUBE, WITH THE ISLAND OF ADA-KALIK
Courtesy: Rumanian Legation



VALCOV IN THE DELTA OF THE DANUBE
 It is a centre for sturgeon fishing and the production of caviar
Courtesy: Rumanian Legation



A VILLAGE IN THE OUAS REGION
In the north-west of Transylvania.
Courtesy: Rumanian Legation

for about three months each year. Galati and Braila are the chief Danubian ports. The new provinces of Rumania added problems to the already complicated transport situation, for the railway lines in the acquired territories all converge toward their former



LAKE BALZA
Courtesy: Rumanian Legation

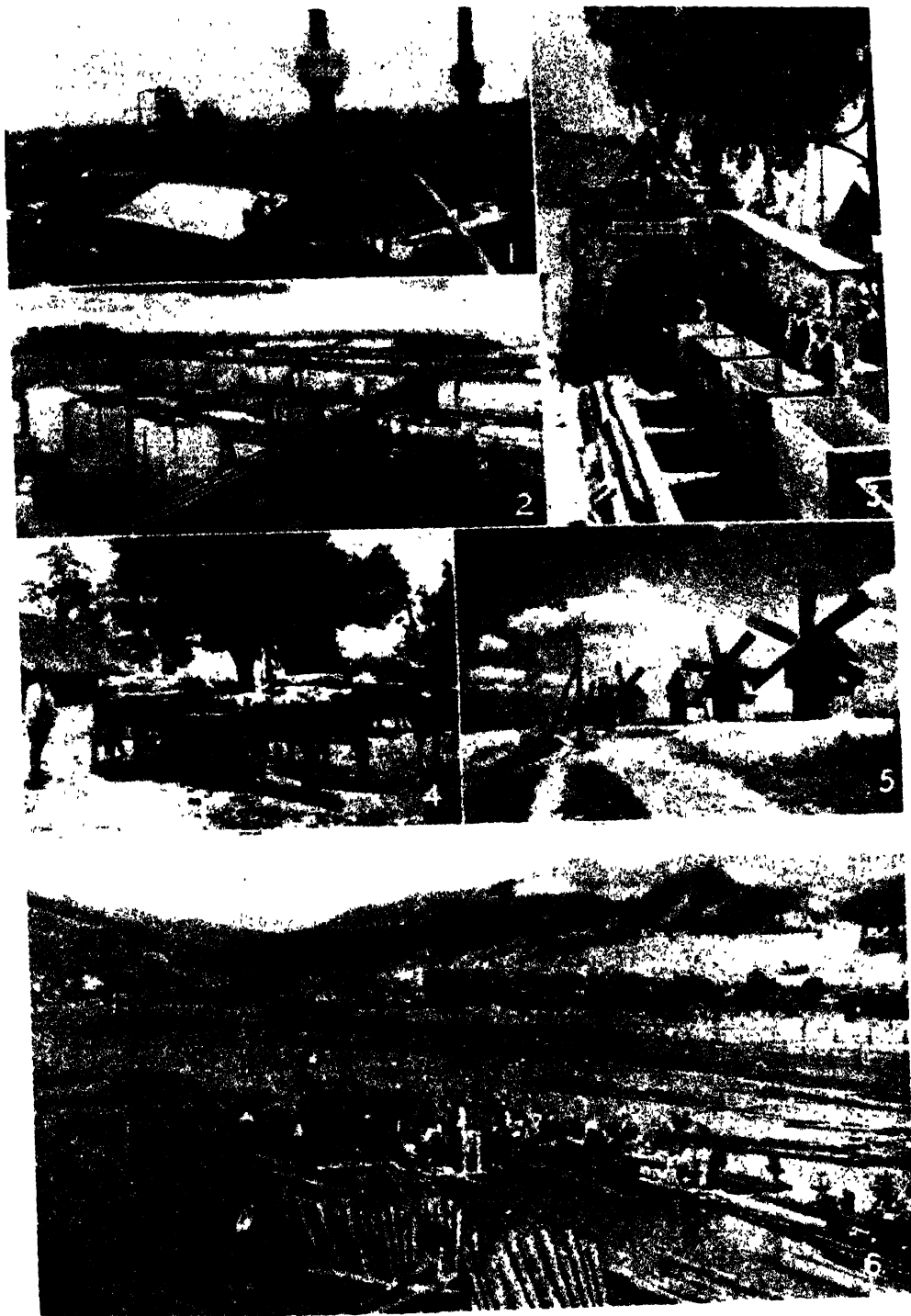
centres of government and commerce. Improved communications are perhaps the chief need in the development of Rumania. There are 7000 miles of railway in the country, owned and operated by the state.

Religion and Education. The Greek Ortho-

dox Church is the official one, but all religious bodies enjoy full freedom. Education is free and compulsory "wherever there are schools," all the schools being maintained by the government, but the percentage of illiteracy is high. There are universities at Bucharest, at Jassy, at Cluj, and at Cernauti.

Government. Rumania is a constitutional monarchy, the throne being hereditary in the male line of descent. The Constitution under which the country is governed was adopted in 1923. There is universal suffrage for the election of Deputies, with partial representation of electoral minorities, and nationalization of the forests and subsoil. The executive power is vested in the king and in a Cabinet of Ministers, who are responsible to Parliament for their acts. The legislative function is performed by the Senate and a Chamber of Deputies. The Senate is composed of 170 members indirectly elected for eight years, and a number of ex-officio life members. The Chamber of Deputies of 387 members is elected for four years by universal, equal, direct, compulsory, and secret suffrage, and the Deputies hold office for four years.

History. The territory included in old Rumania was occupied in ancient times by a people called Dacians. The Roman Emperor Trajan conquered the whole region (A.D. 101-106) and brought here many Roman colonists. Known as Dacia, it was the first Roman province to feel the shock of the barbarian invasions. From the third until the end of the tenth century, this region was invaded by various barbaric peoples who swept from Eastern Europe toward the southern and central parts. Finally, in the thirteenth



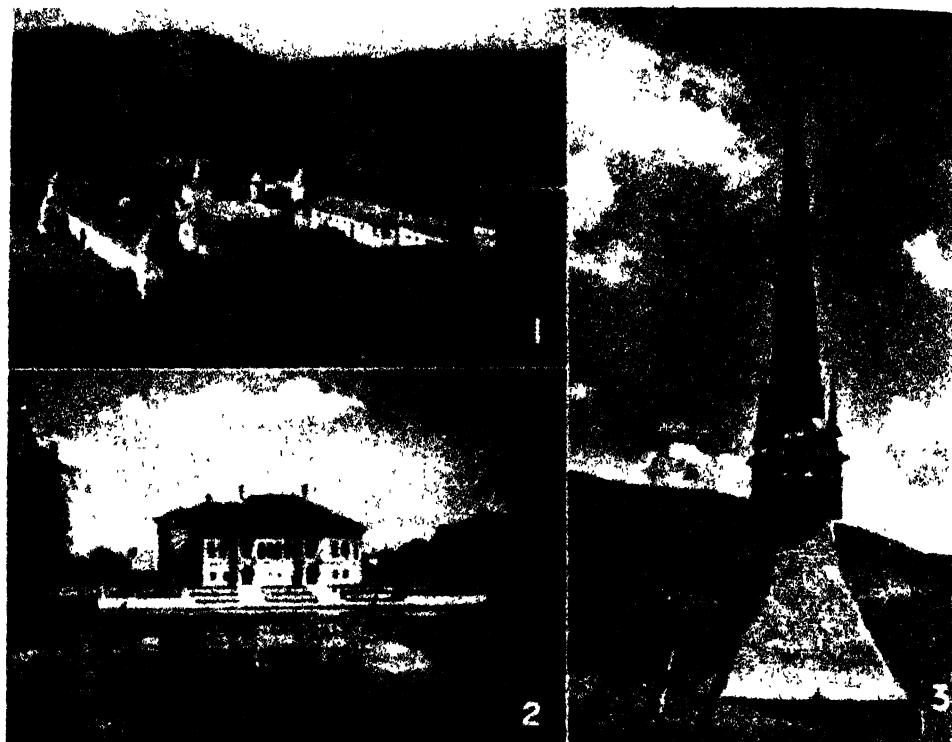
RUMANIAN INDUSTRY AND AGRICULTURE

1. Petrol refinery at Campina in the Prahova valley. 2. Storage tanks at Constanza, the great petroleum port. 3. Gold mine at Rosia Montana in the Transylvanian Mountains. 4. Farm at Banat. 5. Windmills near Husin in Bessarabia. 6. *En File* on the lumber rafts on the Danube.

(opposite) - Rumanian Legion

century, the two independent principalities of Walachia and Moldavia were constituted. After the Turks conquered the Balkan Peninsula in the fourteenth century, these two principalities recognized the suzerainty of the sultan of Turkey and became autonomous provinces. Michael the Brave of Walachia ruled the Rumanians at the close

During the nineteenth century, Russia acquired a right of protectorate over both Walachia and Moldavia. But the national spirit began to awaken, and the desire for union of the provinces and their independence became very strong. The Congress of Paris of 1856 put the principalities under the joint protection of the Great Powers



RUMANIAN ARCHITECTURE

1. The church and fortified monastery at Sucevita in the province of Bucovina. It is in the Moldavian style and was built about the beginning of the seventeenth century. 2. The chateau of Mogosani near Bucharest. It was the palace of Constantin Brancoveanu, Prince of Walachia (1688-1714) and is in the Venetian style. The present owner is Princess Marthe Bibesco. 3. A wooden church spire in Transylvania.

Courtesy, Rumanian Legation

of the sixteenth century for a short time. In 1601 he was assassinated, and Rumania was left to the mercies of stronger nations.

Turkey dominated the principalities in the seventeenth century, though no Turks were allowed to settle on Rumanian soil. During the first decade of the next century, they attempted to free themselves, but Peter the Great of Russia aided the Turks in putting down the uprisings. Rumania was the battlefield for the wars that followed between Russia and Turkey. In 1777 Bucovina was annexed to Austria, and Bessarabia to Russia.

In 1859 Moldavia and Walachia elected as their ruler the same prince, and thus became united under the name of Rumania. In 1866 the prince was deposed, and Charles of Hohenzollern was called to the throne under a modern Constitution. The country remained under the nominal suzerainty of the Sultan of Turkey until 1877, when the Russo-Turkish War broke out. Rumania then declared its independence and joined Russia in the war. The Congress of Berlin (1878) formally recognized the independence of the country, and the lowland territory lying south and east of the Danube, known



TRANSYLVANIAN ALPS: THE MOUNTAINS OF BLĂCEGI IN WINTER
Courtesy: Rumanian Legation



IN THE FOOTHILLS OF THE TRANSYLVANIAN ALPS
Courtesy: Rumanian Legation

as the Dobruja, was acquired by Rumania, having been exchanged for the southern part of Bessarabia, which was taken by Russia.

In 1881 Prince Charles proclaimed himself king. He was succeeded in 1914 by Ferdinand I.

Rumania did not take part in the first Balkan War against Turkey, but helped Serbia and Greece to defeat Bulgaria in the second Balkan War. By the Treaty of Bucharest (7th August, 1913), it obtained from Bulgaria a stretch of territory which amounted to about 2000 sq. miles.

In the hope of gaining the provinces of Transylvania, Bucovina, and Banat, and liberating their oppressed kinsmen from the rule of Austria-Hungary, Rumania entered the World War on the side of the Allies on 27th August, 1916. The Rumanian armies invaded Transylvania. The Central Powers then launched a strong offensive, and after a campaign lasting only three months, the country was overrun and more than half, including the Dobruja, was occupied by the enemy. After the fall of Bucharest (6th December), the seat of the government was moved to Jassy. Rumania was forced by the collapse of Russia to sign the humiliating Peace of Bucharest in May, 1918. The defeat of the Central Powers, later in the year, brought about the liberation of the entire country, and at the Peace Conference, Rumania vigorously pressed its territorial claims to Transylvania, Bucovina, and Bessarabia.

Post-War Period. Rumania was long a standing example of peasant exploitation, and though certain minor reforms had been made to alleviate the sufferings of peasants, they were still compelled to work under the terms of the landlord or starve. Between 1919 and 1920, laws were passed by which lands were expropriated and sold in small lots to the peasants.

King Ferdinand and Queen Marie were crowned with due ceremony on 15th October, 1922; a new Constitution was adopted for the entire united kingdom of Rumania, and formally sanctioned by the king on 28th March, 1923. Political unrest has been prevalent in Rumania, and its source may be traced to the divergent policies of the dominant political parties—the Liberal and the National Peasants. The latter, brought into existence by the agrarian reform which created millions of small but independent peasant proprietors, represents the economic and political interests of the mass of Rumanian peasantry. This party stands for co-operation of the peasants and aid in marketing their crops, and economic co-operation with foreign and domestic capital for

the development of Rumania's extensive natural resources. The Liberal party represents financial, banking, industrial, and commercial interests, favouring high tariffs, trusts, and monopolies.

In 1926 Crown Prince Carol renounced his right to the throne because of a love affair, and designated as his successor his son Mihai (Michael), who came to the throne on the death of Ferdinand on 20th July, 1927.

During his minority, control of the country was to have been in the hands of three regents, the head of the Rumanian Supreme Court, the head of the Rumanian Church, and Prince Nicholas, uncle of the young monarch. Carol, who had a strong following in Rumania, including the Army, returned to his country in June, 1930, and was proclaimed king as Carol II (see CAROL). M. Titulescu, who as Foreign Minister and leader of the National Peasants' party had since the close of the War, worked to uphold the Little Entente and had given Rumania's foreign policy a pro-French and anti-Nazi cast, fell from power in August, 1939. Rumania is a member of the League of Nations.

RUMELIA, *ru me' lia*. The name given by its Moslem conquerors to a region made up of ancient Thrace and a part of Macedonia. In 1878 the Treaty of Berlin made of it an autonomous Turkish province. In 1913 it was divided among Bulgaria, Serbia, and Albania.

RUMINANTS, *ru' min ants*. The name applied to grazing animals which chew the cud, and which are further characterized by their split hoofs. They include camels, llamas, deer, sheep, goats, giraffes, antelopes, and cattle. With the exception of the camel family, they have no incisors, or cutting teeth, in the upper jaw, their place being occupied by a callous gum, against which the lower incisors bite.

The stomach is divided into four cavities. Vegetable food is mixed with saliva and swallowed into the first cavity, called the *rumen*, or *paunch*. It passes unchanged into the second cavity, the *reticulum*, which is sometimes called the *honeycomb bag* because of the pockets in its walls, which are arranged like honeycomb. Here the food is packed into small masses called *cuds*, which latter, when the animal is resting, are propelled upward into the mouth, one at a time, by a muscular action similar to vomiting. These masses are slowly masticated by a kind of rotary motion of the jaws, called "chewing the cud." When sufficiently well masticated, the cud is swallowed, and this time it passes, not into the rumen, but along a muscular groove in the upper wall of the honeycomb

bag, and enters the third division of the stomach, the *psalterium*. Thence it is carried on into the *abomasum*, where digestion takes place.

The ruminants are a division of that group of the animal kingdom known as *ungulates* (which see).

RUMMY. A card game in which each player, after placing a chip in the pool, is dealt seven cards and draws in turn from the remainder of the pack with the object of forming pairings and sequences. A sequence of three cards or three of a kind count nothing, but "free" cards count their face value, aces being one and court cards ten. Any player having less than seven as the total of his hand can call Rummy when all hands are faced and totalled. Any player whose total passes 100 is out but can buy himself in again at the next highest score. The game proceeds until only one player's total is below 100, when he takes the pool.

RUMP PARLIAMENT. This name was given to the remnant of the Long Parliament which, in conjunction with Cromwell's army, brought about the condemnation of Charles I. On 6th December, 1648, two regiments under the command of Colonel Pride entered the House of Commons for the purpose of forcing its members to condemn the king. Ninety-six of the members were imprisoned or driven out, and only sixty of the more violent Independents were permitted to retain their seats. The clearance was called *Pride's Purge*, and the sixty members being, as the Cavaliers said, not the whole Parliament, but only the sitting part of it, were afterwards known by the name of the Rump Parliament. When the Rump attempted to make a stand against certain demands of the army in 1653, Cromwell filled the House with soldiers, pulled the Speaker out of the chair, cleared the room, and declared the Parliament to be dissolved.

In May, 1659, Richard Cromwell retired from the Protectorate, and the Rump was summoned once more, only to be dissolved forcibly by General Lambert in October. Lambert marched north to face General Monk, and on Boxing Day Speaker Lenthall assembled the Rump again. Monk entered London in February. On 11th February, 1660, he declared for the recalling of members of the Long Parliament excluded in 1648. In March, Parliament declared itself dissolved and Monk sent his first message to Charles II in exile.

RUNCIMAN, Rt. Hon. Walter (born 1870). President of the Board of Trade since 1931; educated at Trinity College, Cambridge

(B.A. 1892, M.A. 1895). He took the same keen interest in shipping and business matters as his father, the present Lord Runciman. In 1899

he entered the House of Commons as Liberal M.P. for Oldham, and in 1905 became a member of the Government as President of the Local Government Board. This office was held until 1907. His next offices were Financial Secretary to the Treasury, 1907-8, President of the Board of Education, 1908-11; President of the Board of

Agriculture and Shipping, 1911-14, Commissioner of Woods and Forests and Land Revenues, 1912-14, President of the Board of Trade, 1914-16, and again from 1931.

RUNES, *runz*. The earliest written alphabet used by the Teutonic races of Europe. The name is from a Germanic word meaning "secret," and is closely akin to the word for *magician*, thus showing that these characters were originally known only to a few, probably the heathen priests. Indeed, they were at first used exclusively in charms and incantations, though later inscriptions of all sorts on monuments, slabs, coins, jewellery,



WALTER RUNCIMAN
Photo Photofress

Y N B F R A H * X X P N T () J
i u m a r k runz (run) w n j ch

h (Y) 4 ↑ B M M I X O H F F A Y
p "c

and slips of beechwood (hence *beak*) were carved in runic characters. The runes were made entirely of straight lines, and were arranged either singly or in combination. The strokes were vertical or oblique, but not horizontal, and so were always (in wood) cut across the grain to avoid splitting it.

The oldest runic inscriptions found have dated back to the fourth or fifth century, but the origin of runes is believed to be much earlier than that. The greater number of those discovered are earlier than the eleventh century. Traces of their use are to be found in Germany, France, Spain, England, Denmark, Norway, and Sweden, but the three last-named countries have the largest number of runic monuments.

The Norsemen themselves ascribed the

invention of the sacred characters to Odin, chief of the gods.

RUNNING AND HURDLING. See **SPORT**.

RUNNYMEDE. A meadow where, by tradition, the barons of England compelled King John to sign Magna Carta, on 15th June, 1215. Runnymede is 36 miles south-west of London, on the Surrey bank of the Thames.

RUPEE, ru pē'. A silver coin, the unit of value in the monetary system of British India. Such coins have been current since the middle of the sixteenth century, but they have varied widely in value. In 1832 the weight of the rupee, which is of silver, was finally fixed at 180 grains troy, of which 165 grains were to be pure silver, and this has remained the standard rupee to the present day. Of necessity, the value of the coin has fluctuated as silver has risen and depreciated in value. In 1899, to remedy this defect, the Government fixed the value at one-fifteenth of a pound sterling (one shilling and fourpence). In 1926 the Royal Commission on Indian Currency and Finance recommended the stabilization of the rupee at a rate corresponding to an exchange rate of one shilling and sixpence (gold). The report was accepted by the Government.

For smaller coins, the rupee is divided into 16 annas, and there are issued in silver 8-anna, 4-anna, and 2-anna pieces. The sum of 100,000 rupees is commonly spoken of as a *lakh* of rupees, while 10,000,000 rupees constitute a *crore*. Notes of the values of 1, 2½, 5, 10, 50, and 100 rupees are legal tender throughout British India.

RUPERT, PRINCE OF BAVARIA (1619-82). also known as **RUPERT OF THE RHINE**. The third son of Frederick V, Electoral Prince of the Palatinate, and Elizabeth of England, daughter of James I. He was born in Prague and accompanied his Protestant father during his exile from his dominions after defeat at the hands of the Catholic powers of Germany. As a youth of sixteen, he served under the Prince of Orange, and was present at the siege of Breda (1637). When the Civil War broke out in England, Rupert was not yet twenty-three, but he had already proved himself to be a skilful and dashing cavalry leader and was at once appointed General of the Horse by Charles I. He fought successfully at Worcester and Edgehill in the opening year of the war, and at Chalgrove Field and Bristol in 1643. But at Marston Moor in 1644 and at Naseby in 1645, he was defeated by Cromwell, his impetuosity on the field contributing to his failure. He surrendered to the Parliamentarians under Fairfax in 1645 and was compelled in the following year to leave England. Rupert found refuge at the court

of St. Germain, and there he organized the royalist cause during the years of the Commonwealth. His activities took him far afield; to Ireland, to the Mediterranean, to Barbadoes. At the Restoration in 1660, he returned to England, fought against the Dutch in the naval wars, sharing a command with General Monk and afterwards becoming admiral of the fleet. From 1673-9 he was first lord of the admiralty.

Prince Rupert was interested in scientific



PRINCE RUPERT
(National Portrait Gallery.)

studies and is credited with having introduced many inventions into England, including the mezzotint method of engraving. Rupert's "drops" (globules of red glass with a slender tail, bursting into small fragments on the tail being broken and "prince's metal" (a jeweller's alloy of copper). He was interested in trade and was instrumental in securing a charter for the Hudson's Bay Company.

RUPTURE. See **HERNIA**.

RURAL DISTRICT. See **LOCAL GOVERNMENT**.

RUSH. A popular name for various reed-like plants. Botanically, the true rushes constitute a family of grass-like or reed-like herbs found in wet soil or water. They possess pithy or hollow stems, usually unbranched, and bear slender or sheath-like leaves, small clusters of greenish or brownish flowers, and many-seeded fruits. Most of the species are perennials. The common

rush, also called *bulrush*, is a widely distributed marsh plant. This and other species are used in various parts of the world for making chair seats, mats, basketry, and rushlights, the latter being stripped rush stems, dipped in grease or oil to form candles. See HORSETAIL.

Scientific Names. The true rush family is known as *Juncaceae*, and the common rush is *Juncus effusus*. "Scouring rush" is a common name for species of *Equisetum*, also called "horsetail."

RUSKIN, JOHN (1819-1900). English art critic, social reformer, and writer, born in London. His parents, who were well-to-do Scottish people, attended most carefully to the training of their son, securing for him the best of private instruction and taking him about with them on their extensive travels through England, Scotland, and the Continent. He began to write both prose and poetry even before beginning his course at Oxford (1836), and while at the university, he won the Newdigate Prize for his poem called *Salsette and Elephantia*.

Ruskin devoted himself chiefly to the criticism of art until 1860, when he declared himself a social reformer. This development of his interests is marked by the publication in 1860 of *Unto this Last*, a series of papers treating large changes in the social structure. He then actively interested him-

self in practical schemes for assisting the working classes, and spent on philanthropic undertakings the greater part of the fortune which his father left him. From 1870 to 1879, and again from 1883 to 1884, he was Slade Professor of Fine Art at Oxford. After resigning from this position, he lived at Brantwood, on Coniston Lake, until his death.

In the year after his graduation from Oxford, Ruskin produced the first volume of his great work of art criticism, *Modern Painters*, and other volumes appeared at intervals during the next seventeen years (1843-1860). His original inten-

tion in this work was to prove that modern landscape painters, and especially Turner, were superior to the old masters, but his design broadened as he went on, until the



RUSKIN
Photo. Brown Bros



BRANTWOOD, RUSKIN'S HOME IN LANCASHIRE
Photo. Frith

work came to be a comprehensive discussion of art. Before these volumes were finished, Ruskin published *The Seven Lamps of Architecture* and *The Stones of Venice*, both intended to instruct his readers in architectural subjects.

Among his later works are *Fors Clavigera*, letters written for English working-men; *Sesame and Lilies*, delightful essays on literary and educational subjects; *Ethics of the Dust*; *The Crown of Wild Olive*; *The Queen of the Air*, a discussion of Greek cloud and storm myths; *Mornings in Florence*; and *Praeterita*, a rather sketchy review of his life. His prose is noted for its word painting, and in its melody approaches poetry.

RUSSELL, BERTRAND, LORD (born 1872). Philosopher and author, he succeeded his brother as Earl in 1931. He was educated at Trinity College, Cambridge. His first book, published in 1896, was *German Social Democracy*. Early works include *Essay on the Foundations of Geometry*, *Principles of Mathematics* (1903), *Philosophical Essays*, and *Our Knowledge of the External World as a Field for Scientific Method*. These were followed by *Roads to Freedom* (1918), *The Practice and Theory of Bolshevism* (1920), *The Scientific Outlook* (1931), and *In Praise of Idleness* (1935).

RUSSELL, LORD JOHN, FIRST EARL (1792-1878). The third son of John, sixth Duke of Bedford. He became England's staunchest advocate of Parliamentary reform, and, associated with and supported by Gladstone, Palmerston, Derby, and Aberdeen, he won through with his policy.

He was educated at Westminster School and privately. After a sojourn at Edinburgh University he travelled considerably on the Continent, and in his absence, and whilst under age, was

elected M.P. for Tavistock. For years afterwards he made Parliamentary Reform his theme and became the recognized leader of the Whigs. His first important motion on Parliamentary Reform was moved in the House of Commons in 1822, and defeated. His next attempt was a Bill for the discovery and suppression of bribery at elections, which was also defeated. But he

carried through, although opposed by Sir Robert Peel and Palmerston, a motion for the repeal of the Test and Corporation Acts, which became law. He supported the Catholic Relief Bill, carried 13th April, 1829. Then came the great fight, in Parliament and the country, and the bitter controversy and change of Government before Russell's Reform Bill received the Royal Assent in June, 1832. Lord John's popularity then reached its zenith. In reply to an address of thanks at that time, he said—

"It is impossible that the whisper of a faction should prevail against the voice of a nation."

The first "Reformed" Parliament met 20th January, 1833, and progressive measures which were soon passed included the Dissenters' Marriage Bill, enabling Dissenters to have their marriages celebrated in their own licensed places of worship; a Bill placing municipal government on a popular basis; another establishing civil registration of births, marriages, and deaths; and in 1834 a Bill was passed diminishing the number of offences to which capital punishment was applicable. For more than a quarter of a century the political fight went on, with many reform achievements. On the death of Lord Palmerston in 1865, Earl Russell became Prime Minister, with W. E. Gladstone as Leader of the House of Commons, but resigned in the following year.

RUSSIA. Until 1917 a European and Asiatic empire, including in its boundaries one-sixth of the land and one-twelfth of the people of the earth and ruled as an absolute monarchy. But, after numerous small revolutions with very slight gains, the year 1917 saw the complete overthrow of the imperial rule with its many abuses, and the establishment of a Socialist republic.

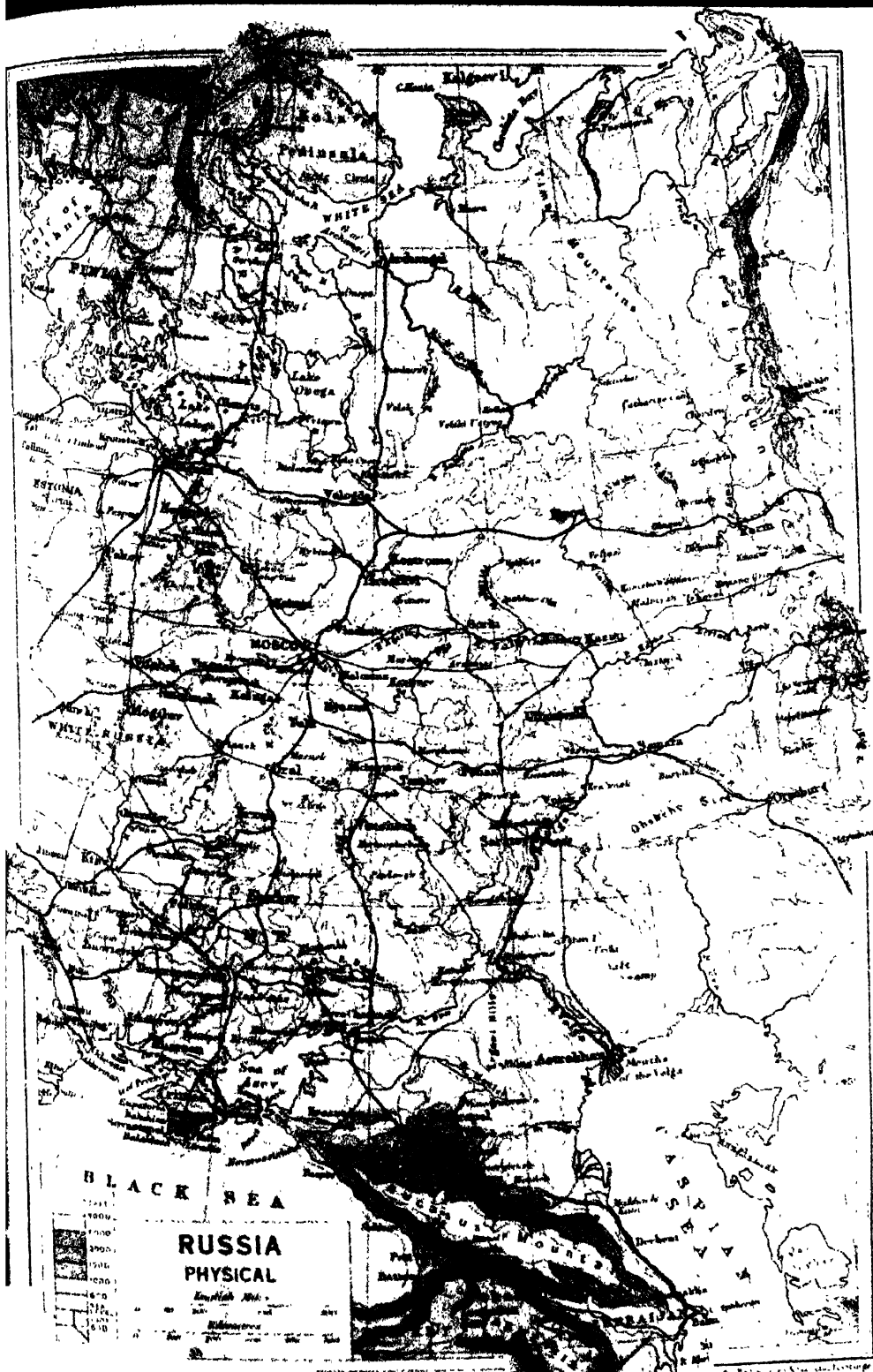
The word *Russia* is no longer the legal designation of the country. In 1923 the official name of the government under the Soviet regime was changed to *Union of Soviet Socialist Republics*.

Stretching across two continents from the Baltic to the Pacific, Russia is the world's largest state. It occupies the eastern half of Europe and the northern part of Asia. The total area of the Union of Soviet Socialist Republics (the U.S.S.R.) and its allied territories is 8,241,921 sq. miles. After the World War, a considerable part of Old Russia was lost in the formation of the new European states; Finland, Estonia, Latvia, Lithuania, and Poland were created, and Rumania gained Bessarabia, at Russia's expense.

Divisions and areas of the Soviet Union —
The Russian Soviet Federated Socialist



LORD JOHN RUSSELL.
(National Portrait Gallery)



RUSSIA POLITICAL

Imperial Miles

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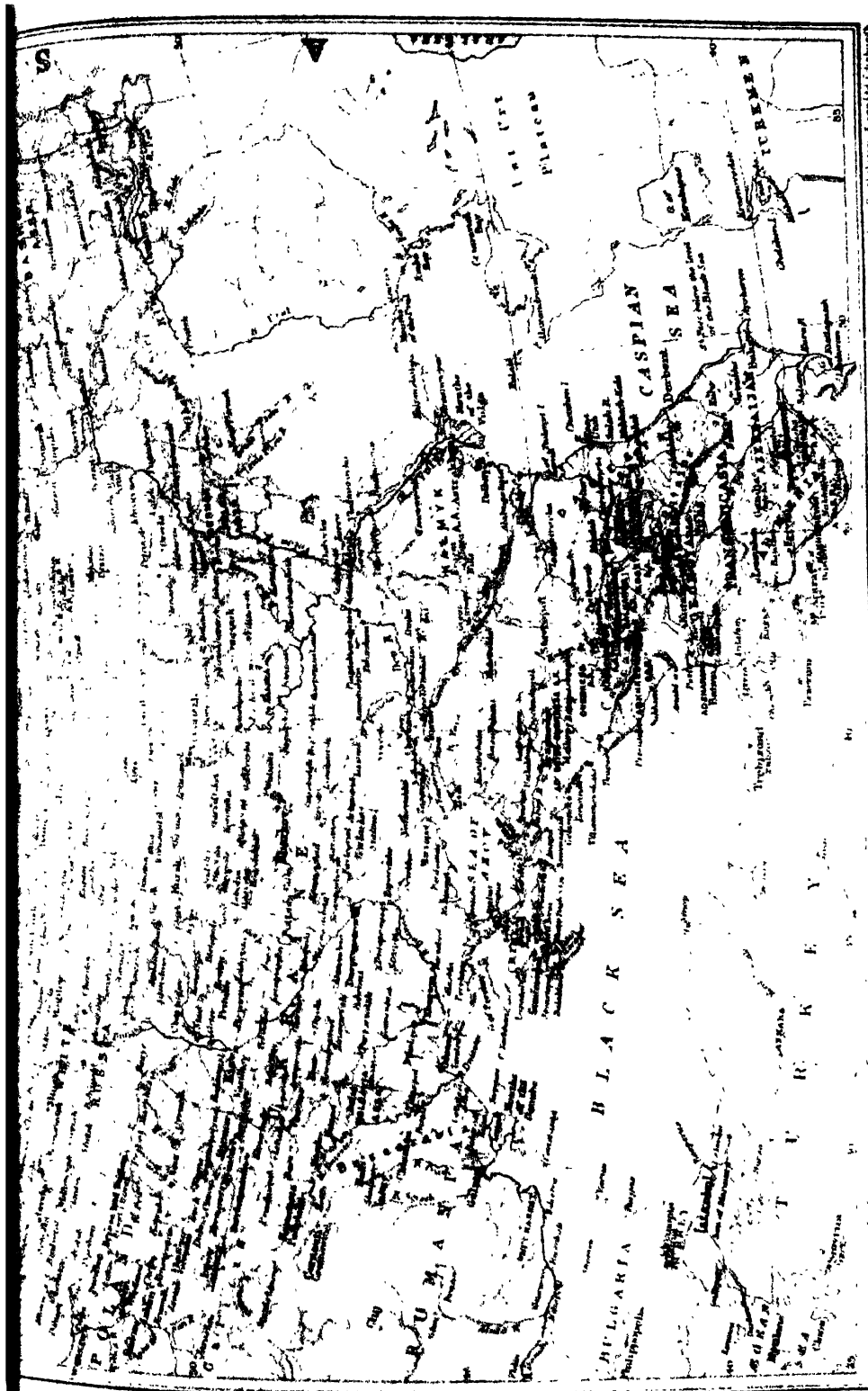
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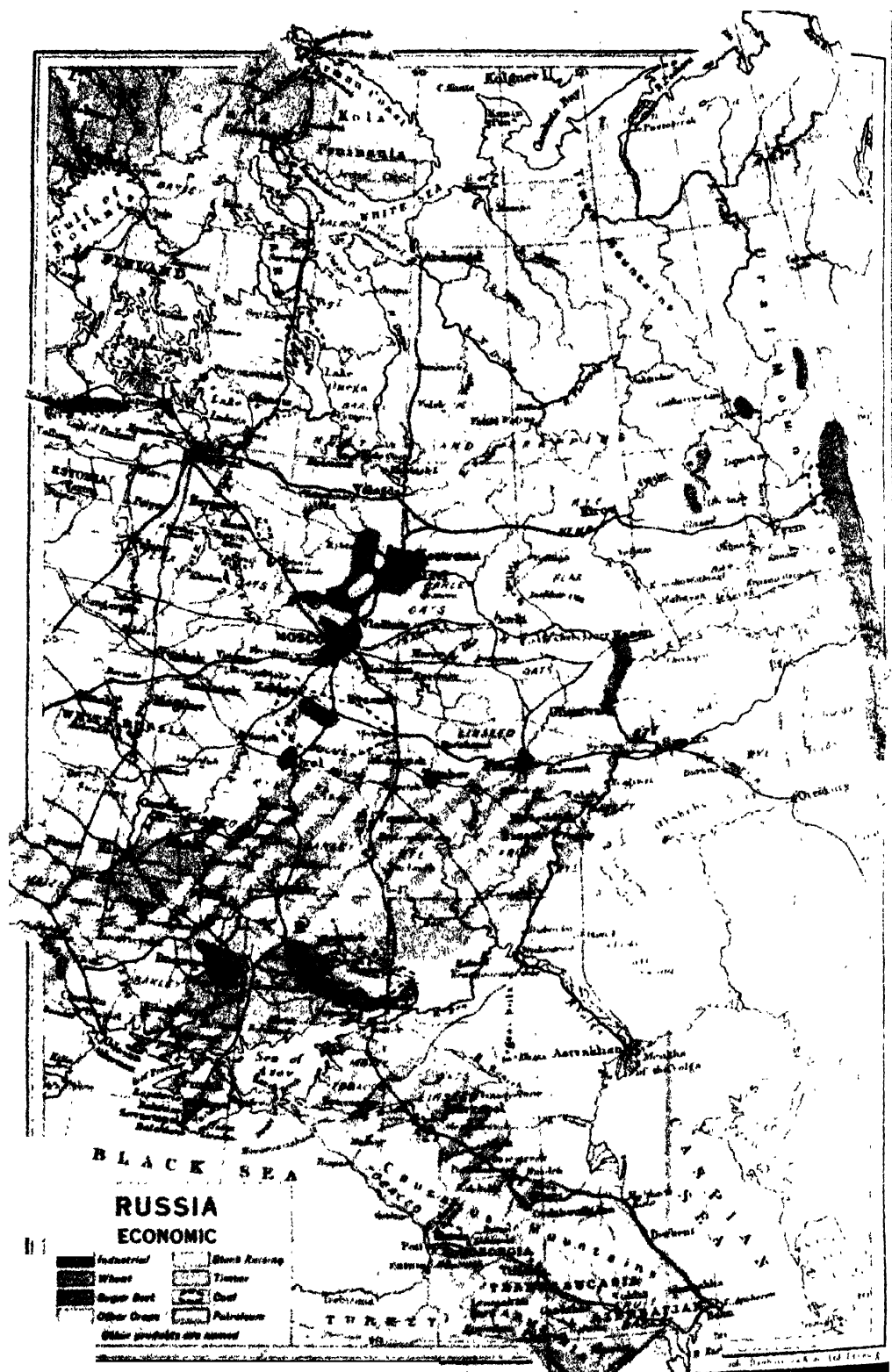
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1:100,000 Scale. P. A. Thompson & Co. Ltd. London.



Republic (R.S.F.S.R.), consisting of Soviet Russia proper, with its many autonomous republics, areas, and regions, has an area of 7,626,717 sq. miles and a population of 113,650,900. In the R.S.F.S.R. are included several areas and republics belonging to Siberia.

The Ukrainian Soviet Socialist Republic, the south-west division of European Russia, has an area of 174,201 sq. miles and a population of 31,901,400.

The White Russian Soviet Socialist Republic (in the west, adjoining Poland) has an area of 48,751 sq. miles and a population of 5,439,400.

Georgia, Armenia, and Azerbaijan together form the Transcaucasian Soviet Federated Socialist Republic, with a combined area of 71,255 sq. miles and a population of 7,110,800.

The Turkmen Soviet Socialist Republic has an area of 189,603 sq. miles and a population of 1,268,900.

The Uzbek Soviet Socialist Republic has an area of 74,786 sq. miles and a population of 5,044,300.

The Tajik Soviet Socialist Republic has an area of 56,608 sq. miles and a population of 1,332,700 (1933 estimates).

The People. The majority of the population of 173,000,000 (1936 estimate) are Slavs and belong to the "Alpine" group. They are usually divided into Great Russians, Little Russians (or Ukrainians), and White Russians. The rest of the people are Ugrians, Turks and Mongols, including the Samoyeds of the far north, Zyrians, Karelians, Turkotatars, and Caucasians. The Jews form a large percentage of the population in many areas. Russia in Europe has a population of about 108,000,000.

Cities. The two outstanding cities, Moscow and Leningrad, are treated in separate articles. Samarkand, Tashkent, and Khiva are described under **UZBEK**; Ashkhabad, under **TURKMEN**; Kharkov, Kiev, and Odessa, under **UKRAINE**; Baku, under **AZERBAIJAN**; Tiflis and Batum, under **GEORGIA**; Omsk, Irkutsk, Tobolsk, Tomsk, and Vladivostok, under **SIBERIA**; Minsk under **WHITE RUSSIA**. During the last ten years many new towns have come into existence in the new industrial areas. Other important cities are—

Archangel (Arkhangelsk), capital of the Northern area, is an important timber port on the White Sea, about 500 miles north-east of Leningrad. It is the world's most populous city so far north, being less than 2° south of the Arctic Circle. For more than six months of the year, the port is closed by ice, in spite of the use of ice breakers. Founded, 1584; population, 194,300 (1933).

Astrakhan, an important trading centre,

is on the delta of the River Volga, about 50 miles from the Caspian Sea. Trade is carried on with all Caspian ports, and with inland towns by means of the great waterway of the Volga. The town gives its name to a fur which is the skin of the new-born or stillborn Persian lamb. Population, 225,400 (1933).

Dnepropetrovsk (Dniepropetrovsk), formerly *Ekaterinoslav*, is about 220 miles north-east of Odessa, on the River Dnieper, near Dnieprostroy, where the huge hydroelectric plant and dam were opened in 1932. Dnepropetrovsk is the steel centre of the Ukraine. Population, 379,200 (1933).

Kazan, at one time the chief intellectual centre of eastern Russia, is the capital of the Tatar autonomous republic within the Russian Soviet Federated Socialist Republic. It is near the junction of the Kama with the Volga. Kazan is a manufacturing and market town. Population, 258,700 (1933).

Kronstadt, an important naval station, is 21 miles west of Leningrad, on an island in the Gulf of Finland. In its three harbours 1000 vessels can be accommodated. The harbours are closed by ice through five months of the year. The city was founded by Peter the Great in 1710. Population, about 32,000.

Magnitogorsk is a new town in the southern Urals which is engaged chiefly in the iron and steel industry. Population 155,000 (1933).

Murmansk, an Arctic Ocean port on the far northern peninsula of Kola, is 600 miles nearer the Atlantic than Arkhangelsk on the White Sea, and, owing to the influence of the Atlantic drift, is ice-free throughout the year. The town dates only from 1916. It is the terminus of a railway connecting it with Leningrad, 700 miles distant. Population, 71,860 (1926).

Gorky (formerly Nizhni Novgorod), was founded in 1221, and was famous for the great commercial fair which was held each summer until 1930. The city lies 265 miles east of Moscow, at the junction of the Volga and Oka rivers. Population, 451,000 (1933).

Rostov-on-Don, the administrative centre of the Northern Caucasian area, is a port 27 miles from the mouth of the River Don. It is a grain-collecting centre and an industrial city. Population, 520,700 (1933).

Stalinabad, the capital of the Tajik S.S.R. (Tajikistan) in Soviet Central Asia, was formerly known as Dushambé. A large cotton mill is the chief industrial plant. Population, 40,000 (1931).

Saratov (sa rah' tof), the capital of the area of the same name, lies 450 miles south-east of Moscow, on the heights which rise from the right bank of the Volga.

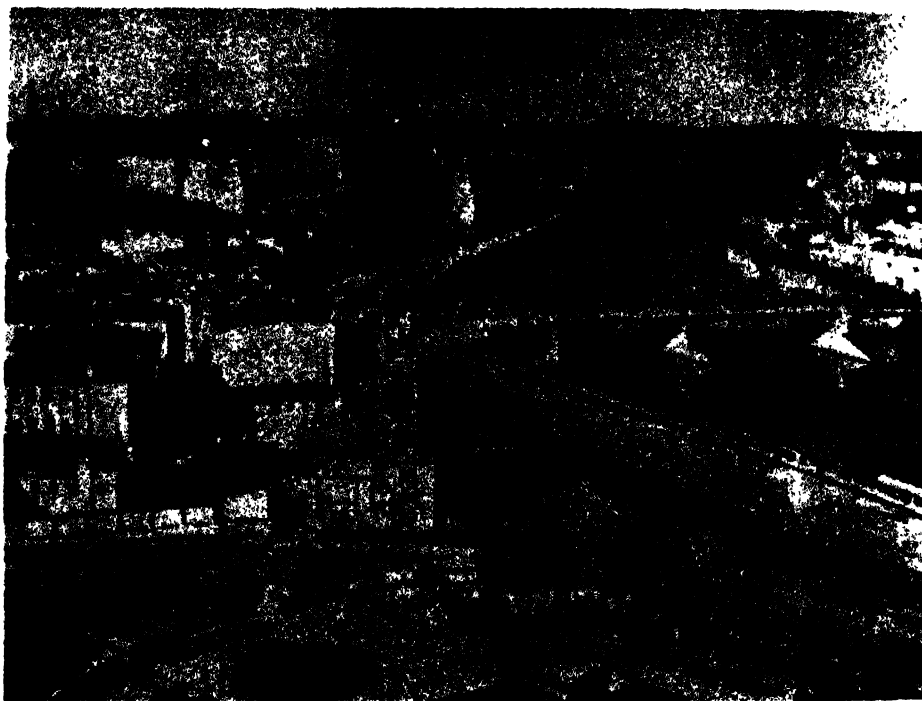
Agriculture and manufacturing are the principal industries. Population, 327,500 (1933).

Stalingrad, formerly *Tsaritsin*, on the lower Volga, is now noted for its great tractor factory, and from a small market centre has grown to have a population of 388,000 (1933).

Surface. In general the European territory of the Soviet Union, which is more particu-

tain, on the south coast of the Crimea, are the only mountains in Russia proper, but the Caucasus, extending between the Black and the Caspian Seas, contains snow-capped peaks of over 18,000 ft.

Rivers and Lakes. Most of the rivers have their sources in the central Valdai heights. With few exceptions, the rivers are deep, slow, and navigable for boats of light draft almost to their sources.



MOSCOW WITH THE KREMLIN IN THE BACKGROUND (LEFT)

Photo: Topical

arly treated of in this article, consists of a vast plain without mountain ranges and diversified only by low hills and uplands which nowhere exceed 1400 ft.

The heights of the Volga extend along the right (west) bank of that river from Gorky (*Nizhni Novgorod*) to Stalingrad, some 730 miles, and reach an altitude of over 1300 ft. In the south-east is the largest area in the world below sea level, the basin of the Caspian, whose waters are 86 ft. below the Mediterranean.

The Ural Mountains, constituting part of the boundary between Russia and Siberia, form a range whose highest peaks do not exceed 5000 ft.; they are broken by cross valleys into the Northern, Central, and Southern Urals. These and the Yaila Moun-

The Arctic rivers include the Pechora, rising in the Ural Mountains; the Northern Dvina, noted for its volume of waters; and the Onega. The latter flows into the White Sea.

The Baltic system includes the Neva, the outlet of Lake Ladoga, a stream of great volume, upon whose banks Leningrad is situated.

The Black Sea rivers are the Dniester and the Bug, both of which are navigable; and the Dnieper, the second largest river of Russia, draining an area as large as France. The Don flows into the Sea of Azov, an arm of the Black Sea. Its chief tributaries are the Donetz and Koper.

The chief river flowing into the Caspian Sea is the Volga, the largest river of Europe.

There are numerous lakes in the north-eastern section. Lake Ladoga, the largest, has an area of 7000 sq. miles; Lake Onega is about one-half as large.

Climate. In general, the climate is continental; that is, the winters are cold and the summers warm. The difference between the mean summer and winter temperature amounts to 40° F. in some parts and to 63° F. in others, the difference increasing

Flora. In the Arctic zone the vegetation consists of the tundra, and this is frozen for a large part of the year. Here the plants are chiefly mosses and lichens, with a few hardy shrubs, and, in places where humus has accumulated, such flowering plants as can withstand the severity of the climate. South of this is the great belt of coniferous forests, which extends southward to an irregular line drawn from the Gulf of Finland to the



MODERN RUSSIAN PAINTING

An impression of a military parade in Red Square, Moscow, by Youon, a contemporary artist.

Photo: Society for Cultural Relations

from south to north, at the rate of about 9.7° F. for each degree of latitude. From west to east, the difference in temperature is more marked. The temperate winds from Western Europe raise the mean temperature of the western part of the country, but the south-east winds from Asia are cold and raw. There is a very pronounced difference between the region bordering on the Arctic Ocean and that around the Black Sea. The former is in the grip of ice and snow for six or eight months each year; the latter lies in the warm temperate region. The transition from one extreme to the other, however, is gradual.

The rainfall decreases from the north-west to the south-east. It is 21 in. at Moscow, 15 in. at Kazan, and 6 in. at Astrakhan. A heavy mantle of snow covers the entire country during the winter.

southern end of the Ural Mountains. To the south and west is the deciduous-leaved forest, which blends on its southern and eastern border with the grassy plains, or steppes, that occupy the south-eastern part of the country.

The larch, silver fir, pine, birch, and other trees are found in the northern part of the forest belt. The deciduous forest, or oak region, as it is called, occupies all of Central Russia.

In their native condition, the steppes were covered by a luxuriant growth of grass and herbaceous plants. Such trees as the wild cherry and wild apricot are found on the slopes, bordering streams, and thickets of willows are found in the depressions. However, nearly all this region has been changed by cultivation, and fields and pastures are seen on every hand.

Animals. In the far north, the seal and the reindeer are found. The forest is the home of many fur-bearing animals. Here are found bears, wolves, foxes, the elk, and various species of deer, the wild boar, and the glutton. In the more open forests of the central part of the country, squirrels, hares, and many other small animals occur in large numbers. The agricultural region contains animals of the marmot family. In the north wild geese, ducks, and other waterfowl frequent the marshes during the nesting season.

Agriculture. Agriculture is the chief occupation of over four-fifths of the population, but is rivalled in importance by manufactures. The variation in temperature and rainfall over so wide an extent of territory makes diversity of agricultural interests necessary. In the extreme north, agriculture cannot be practised, but elsewhere crops can be grown. In the region of the great forests

there are few farms, but throughout the large area south of an east-and-west line passing through Leningrad, most of the land not forested is under tillage. In the south-east is the vast black-earth region, constituting one of the greatest wheat countries in the world. It is from this region that Russia exported, under pre-war conditions, up to 100,000,000 bushels of wheat each year.

The production of grain is again nearing pre-war volume. During 1930 a total of

about 93,000,000 bushels were exported. According to acreage, the leading crops are wheat, rye, oats, millet, barley, potatoes, maize, sunflower, and buckwheat. Flax (for fibre and seed), hemp, sugar-beets, and cotton are also important crops. Livestock

breeding is also on the increase.

The total area under cultivation in the U.S.S.R. is over 320,000,000 acres. A new phase of agricultural development is the establishment of a number of state grain farms. In order to increase the production of grain, the Soviet Union is also striving to have groups of peasants work together in so-called "collectives," which can use modern machinery to better advantage because of the larger acreage under cultivation. By the end of 1934, 80 per cent of all peasant households were cultivators on collective farms.

Minerals and Mining. Mining developed less rapidly than in other European countries, because of scarcity of fuel and lack

of transport facilities. After the beginning of the present century, however, the iron and coal industries made rapid progress, largely owing to investments by French and Belgian capitalists, and the introduction of scientific methods of mining and smelting. The principal coal districts in European Russia are in the Donetz basin of the Ukraine and around Tula, south of Moscow. There is also coal in the Urals. Iron ores occur near Kursk and in the Urals. In 1913 the production



RUSSIAN AGRICULTURE

Above: Mother and daughter gathering the harvest. In some districts all farm work is done by the women while the men do seasonal work at the factories. *Below:* Mechanization of agriculture: a machine sorting seeds for spring sowing on the Petukhovskiy State Grain Farm in the Ural region.

Photos: P. & A., Society for Cultural Relations

of coal within the present territory of the Soviet Union, including Asia, was 29,053,100 metric tons; by 1921 the output had declined to 10,000,000 tons, a decrease of about two-thirds. Then came a period during which the Soviet Union, without the aid of foreign capital, increased its coal production year by year until a yield of 93,400,000 metric

one-half, falling to 4,000,000 tons in 1921. By 1935 the output was 25,000,000 tons.

In the Urals there are also potassium salts, gold, (the U.S.S.R. is the second largest producer) one-half of the world's supply of platinum, and copper, manganese, and asbestos. Copper is also found in the Caucasus Mountains and the Georgian Republic, and



RUSSIAN PEASANT TYPES

1. Uzbek delegate to the Congress. 2. Woman delegate from Uzbek. 3. Peasants by the Volga.
4. Wood-worker in Uzbekistan. 5. Delegate from Samarkand to the Congress. 6. Woman delegate from the Minsk district of White Russia

Photos: Society for Cultural Relations, P. & A

tons was reached by 1933. New projects include the sinking of new shafts in the Donetz Basin and in the Urals, and the opening of new mines in Siberia.

The iron and steel industry made a slower recovery, but was placed on a firm basis of prosperity. Plans were developed for the erection of steel mills in all the regions of raw material. The output of iron ore in 1934 was 21,700,000 tons.

Russia has rich oil deposits, the principal districts being those of Baku, west of the Caspian Sea (in Azerbaijan); Grozny, in Northern Caucasia; Emba, to the north of the Caspian; and the Siberian island of Sakhalin. The pre-war production of 9,234,900 metric tons (1913) declined over

manganese in the Ukraine. Silver, lead, mercury and chromium ores, pyrites, graphite, sulphur, asphalt, mica, zinc, phosphate rock, nickel, antimony, bismuth, arsenic, bauxite, and salt are all found in quantities in widely scattered areas.

Fisheries. The waters on the north-west coast and the rivers and lakes abound in the best varieties of food fish, including cod, salmon, and sturgeon, the last-named furnishing caviar. The north-west coast and the Caspian Sea and rivers flowing into it provide the chief fishing grounds.

Forests. The Soviet Union has the most extensive woodlands of any country in the Old World—amounting, it is estimated, to 405,000,000 acres; and though much of this

is difficult of access, large quantities of timber are exported.

Development. The Soviet government operates more than 90 per cent of the large industries through the Supreme Economic Council of the U.S.S.R. and local councils. Private companies, industrial co-operatives, and foreign concessionaires carry on the remaining enterprises. It is the policy of the Soviet government to permit foreign capital to engage in certain productive activities under special concession agreements. These concessions are granted not only for the construction and operation of factories and mills, but also for the building of roads and houses, and for the development of natural resources.

Manufactures. Production is now above the pre-war average. hydro-electric power is being rapidly developed. Among the many schemes now completed or under construction is the hydro-electric Dnieper River Plant, with a capacity of 800,000 horsepower (see above).

The welfare of the worker occupies a prominent place in the industrial programme. Shorter hours, rent graded to meet income, vacations of two to four weeks, according to the nature of the work, free medical and sanatorium care, free insurance, four months' absence for childbirth, free nurseries in villages and factories for working mothers; these are some of the innovations being introduced in the more progressive provinces, but so far they affect a small minority of the people.

Commerce. In the U.S.S.R., foreign trade is a State monopoly, import and export operations are carried on with special licences, issued by the Commissariat for Trade to State, co-operative, and private organizations.

The greater part of both wholesale and retail trade is carried on by the State and co-operative organizations.

Trade between the Soviet Union and Great Britain was £25,000,000 in 1935, of which £21,700,000 were imports from Russia.

It has shown an increase since 1933. British imports are timber, oil, fish, butter, hides, and grain. The trade turnover with Germany far exceeds that with any other country (estimated at £42,980,000 in 1933).

Transport. During all the centuries of its existence, the rivers of Russia have been the great highways of commerce and civilization. It was down the Dnieper that the Northmen descended against Constantinople and, in their return by the same route, brought back Greek civilization to Kiev. Nearly all the navigable rivers are connected by canals, and boats can pass from the Caspian and the Black seas to the Baltic.

The Black and the Caspian seas are also connected by waterways, as are the Baltic and the White sea. Although the rivers and canals are closed by ice from a quarter to a half of the year, fully one third of the freight is transported by water.

Russia has (1934) 52,130 miles of railway in operation. Moscow is the chief railway centre, and the southern half of



RUSSIAN PAINTING: MARCH OF YOUNG COMMUNISTS

Photo: Society for Cultural Relations

the country has good railway facilities. The Trans-Siberian Railway is one of the most extensive systems in the world. Aerial transport is making great headway.

Social Conditions. Many conditions have combined to prevent civilization in Russia from advancing as rapidly as it has in the countries of Western Europe. Chief among these causes are the extent of the country, with a consequent diversity of interests, the great number of races represented in the population; a land system which for centuries was exceedingly oppressive to the common people, and a bureaucracy which administered the government in its own interests. Russian society was divided into three classes: the aristocracy, which, until 1861, held almost absolute sway over the nation; the great middle class, including professional men, merchants, and other business men; and the ordinary peasantry, constituting by far the largest part of the population, the majority of whom lived in extreme poverty and ignorance.

To-day, it is asserted there is only one class in Russia, the proletariat, which rules for the benefit of all. In actual fact, the bureaucrats who rule are recruited and supported by one small class, the members of the Communist party.

The Communist party, according to official Soviet reports, numbers over 2,800,000 members, and the Young Communist organization has enrolled about 5,000,000 members.

tion of the R.S.F.S.R., which replaced the former Ministry of Popular Education, includes the Academy of Arts, theatres, educational institutions of specialized types, and municipal schools. One of the principal reforms was the introduction of schools which have two grades, for pupils from 8 to 11 years and for those from 12 to 17 respectively. In all schools education is both manual and cultural.



LUNCH-TIME PROPAGANDA
Photo: Society for Cultural Relations

Membership of the Communist party, which in effect is the basis of the government's power, is an honour keenly sought after, for it carries with it many privileges. However, only those who satisfy the extremely strict requirements of the leaders are admitted, for being a militant minority, it can only admit those who give it wholehearted support and can render active assistance.

Education and Culture. Though some progress was made in popular education during the decade before the revolution, a complete system of general education was not established until the Soviets gained control of the government. There are separate Commissariats for Education in all the constituent republics of the Soviet Union. Thus each nationality is free to develop its own culture. The Commissariat for Educa-

tion Under the old régime there were universities at Moscow (two), Leningrad, Kazan, Saratov, and Perm. These continue under State control, and others have been added. Much attention is paid to specialist education for industry.

Religion. Under the empire, the State religion was the Graeco-Russian, or Orthodox Catholic. Until the revolution of 1917, the Tsar was the head of the Church. In that year the Church was disestablished. From 1917 to 1927 the constitution of the Soviet Union allowed the practice of all religions. Since 1929 anti-religious propaganda has been encouraged.

Government. Until 30th October, 1905, Russia was an absolute monarchy, with the supreme authority vested in the Tsar. He was assisted by a Council of Ministers, the

members of which were appointed by him, and were responsible to him only. In 1905 a Constitution providing for an elective assembly was granted. Partial local self-government was provided through the *zemstvos* (local land councils).

After the Tsar was deposed, an attempt was made to establish a Socialistic republic under the leadership of Alexander Kerensky. The radical faction, headed by Nikolai Lenin,



CAUCASIAN PEASANTS

Photo Society for Cultural Relations

succeeded in overturning the Kerensky regime in November, 1917, and a Soviet republic was established (*soviet* means "council").

The new Constitution of the Union of Soviet Socialist Republics, which was finally ratified in 1924, unites in a single body the six constituent republics, with similar Constitutions. The highest organ of authority in the U.S.S.R. is the All-Union Congress of Soviets, composed of delegates from urban Soviets and from provincial Congresses of Soviets. The All-Union Congress of Soviets elects a Council of the Union from among the delegates to the Congress, in which each republic gets proportional representation.

The other legislative chamber is the Council of Nationalities, consisting of five delegates from each of the allied and auton-

omous republics, and one delegate from each autonomous area, all elected by local Soviets.

The Council of the Union and the Council of Nationalities together form the Central Executive Committee, which assesses decisions of the higher executive organs of the Union and of the allied republics.

Between the sessions of the Central Executive Committee, the supreme legislative, executive, and administrative organ of the U.S.S.R. is the Presidium of the C.E.C., consisting of twenty-seven members and including eighteen members of the presidiums of the Council of the Union and the Council of Nationalities.

The C.E.C. of the U.S.S.R. appoints People's Commissars of the U.S.S.R., who form the Council of People's Commissars, which is the administrative organ of the Central Executive Committee.

The Commissariats for Foreign Affairs, War and Navy, Domestic and Foreign Trade, Transport, and Posts and Telegraphs serve for the Union as a whole, while the Commissariats for Labour, Finance, Inspection, and the Supreme Economic Council (commissariat for industry) unify the corresponding commissariats of each of the allied republics. There are no all-union commissariats for agriculture, interior, justice, education, health, and social welfare, these matters being administered by the allied republics themselves.

Village, municipal, district, provincial, regional, and republican affairs are administered by corresponding Soviets or Congresses of Soviets, representing the lower bodies.

Election of delegates to the Soviets take place on the basis of occupational rather than geographical representation.

The following have no votes: those employing others for profit; those living on unearned income; priests; and members of the former police or reigning dynasty.

A revised constitution of 1936 reintroduced the secret ballot.

HISTORY OF RUSSIA

In the middle of the ninth century, Slavs and Finnish tribes are known to have inhabited the forest region around Lake Ilmen, between Lake Ladoga and the upper waters of the Dnieper. The Slavs settled also along the middle course of the Dnieper. In the ninth century, the Northmen spread across the North Sea, and some went over the Baltic and up the Russian rivers. About 850, one of the Northmen, Rurik, established a kingdom and consolidated the Slavic tribes around Novgorod. The Finns gave the name of Rous to these invaders, and the

Arabic historians, recording their penetration to the Caspian and Black Seas, called them Russians. Intercourse with Constantinople and Byzantine civilization left its mark upon Russia, especially when Russia adopted Greek Christianity in the tenth century.

This Eastern civilization was checked when the Mongols swept over Northern Asia in the thirteenth century. Genghis Khan overran Russia and made the Christian princes vassals. Among these princes, the Grand Duke of Moscow became the most powerful and the favourite of the Khan of the Golden Horde. In the fifteenth century, Ivan III of Moscow threw off the Mongol rule, overcame the republic of Novgorod, and laid the foundations of the Russian Empire.

Beginning of Modern Russia. Previous to the Romanoff dynasty, which began with Michael Feodorovitch (1613-1645), the grandfather of Peter the Great, the Russian rulers were men of little note. Russia's progress as a nation began with the reign of Peter the Great, the "Father of Modern Russia." He introduced into the government many of the ideas and methods of the more progressive nations of Western Europe, founded Petersburg, which later became known as St. Petersburg and is now Leningrad; inaugurated shipbuilding and advanced other industries, and in many ways welded his vast domain into a strong, centralized power. Some of Peter's ideas were strenuously opposed by the nobility, and for a brief period after his death, the movements he had begun languished. However, under Catherine II (1762-1796), Russia again made rapid advances in civilization, and was fully recognized as a Great Power. It was during her reign that Poland was partitioned, and 180,000 sq. miles of territory with 6,000,000 inhabitants were added to Russia. Successful wars were waged against the Turks. See RUSSO-TURKISH WARS.

Alexander I joined Austria against Napoleon, but their combined armies were defeated at Austerlitz. Later, Alexander entered into an agreement with Napoleon whereby he acquired Finland and the Aland Islands from Sweden, and compelled Turkey to cede to Russia the territory between the Dniester and the Pruth. In 1812, however, Alexander joined the alliance against Napoleon, whose overthrow he was largely influential in accomplishing. At the Congress of Vienna, the Duchy of Warsaw was ceded to Poland, which was then under control of Russia. During the reign of Nicholas I, who ascended to the throne in 1825, Russia extended its dominions in Asia.

Abolition of Serfdom. Alexander II abol-

ished serfdom throughout the empire in 1861. Loans were also provided, and many of the freed men were able to purchase small farms. In 1864 the zemstvos were instituted. But notwithstanding these reforms, there was a growing spirit of revolution throughout the country. In 1877 war was declared against Turkey and vigorously prosecuted. In less than a year, the Russian forces had advanced almost to Constantino-



TYPICAL RUSSIAN CHURCH
Photo OKO

ple, when the other European Powers intervened and again deprived Russia of its long-coveted prize, a southern outlet to the sea. On 13th March, 1881, Alexander II was assassinated in St. Petersburg by revolutionary conspirators.

Alexander III, who succeeded to the throne in 1881, extended Russian dominions in Asia, inaugurated a persecution of the Jews, began the Trans-Siberian Railway, and formed an alliance with France.

Bureaucracy and Unrest. Alexander III died in 1894, and was succeeded by his son, Nicholas II, who was deposed in 1917. The Trans-Siberian Railway was completed, and other important lines in Asia were constructed. At the close of the war between China and Japan, in 1895, Russia secured from China the lease of Kwangtung Peninsula for twenty-five years. The port of

Dalny was opened, and a naval station was established at Port Arthur.

Another treaty with China provided for the construction of the Manchurian Railway, and under pretence of guarding the railway, Russia assumed military occupation of Manchuria. These measures had been strenuously opposed by Japan, and in 1904 that country declared war against Russia. Russia



RUSSIAN POSTERS

These are not designed for use out of doors but are placed on the walls inside workers' clubs and other communal centres.

Photo: Society for Cultural Relations

was defeated, and was forced to withdraw from Manchuria and Korea.

But of far greater significance than the war were the social and political movements within the empire, to which the war gave a strong incentive. For more than a century, there had been almost constant friction between the aristocracy and the people, and during the last half of that century, the zemstvos had been educating the people in democracy. The strained relations occasionally led to riots and attempts at revolution. These disturbances were quelled by the police or the army, and the leaders were usually executed; nevertheless, the spirit of democracy continued to increase.

The most intelligent classes realized that Russia's defeat in the war with Japan was the result of the inefficiency and corruption

of the bureaucracy, which the Tsar was unable and apparently unwilling to control. In addition to this, the government had refused to grant relief from an intolerable land system, under which the people of some districts were starving in a land growing grain for export. Moreover, with the growth of Russian capitalism, a labour class developed in the cities, forming the nucleus of a great party of protest.

Revolution came in 1905, inaugurated by a series of great strikes. In an attempt to break the strike in St. Petersburg, over 500 people were killed, and over 3000 were wounded by the police and the soldiers.

The ruling power finally realized that it was unable to control the situation by repressive measures, and the Tsar granted a Constitution providing for a national assembly elected by the people. Such restrictions, however, were thrown about this assembly, the *Duma*, that it could accomplish little in the way of direct legislation. The *Duma* met 10th May, 1906.

Successive *Dumas* passed important laws regarding popular education, national defence, and peasant conditions, and the influence of this great national assembly continued to increase throughout the empire; furthermore, the oppressive measures of the bureaucracy met with more strenuous opposition from year to year. Matters had almost reached a crisis when all factions were united by the entrance of Russia into the great European war. See WORLD WAR.

The Revolution of 1917. At the beginning of the war, the *Duma* pleaded for the united effort of all factions and agencies in carrying it forward, but the plea was not favourably received by the bureaucracy, whose acts were characterized by the usual delays and speculations. When the great Russian drive of 1915 was followed by the retirement of the army from the territory it had conquered, the people began to inquire into the causes.

It is now known that, although there was plenty of ammunition, it was impossible for its transport to be handled with efficiency because of the greed and jealousy of those in power. Moreover, some of the Ministry were in sympathy with Germany and intriguing to conclude a separate peace. Public indignation brought about a temporary improvement in the situation, and Russian arms gained encouraging successes in the spring and summer of 1916.

Then matters became worse than ever. Conditions on the war front were appalling. There was a deficiency of every necessary article of equipment, including ammunition. It is authoritatively reported that the soldiers had to pull down barbed wire defences with bare hands and clap them

hands together to imitate machine-gun fire, as there was ammunition for only one gun in three. Stürmer, a reactionary and German sympathizer, was appointed Foreign Minister, and intrigues for a separate peace were soon under way. Through the winter of 1916-1917, the revolutionary movement gained momentum, and on 12th March, 1917, the Tsar abdicated in favour of his

and for weeks struggled heroically against the disorganization in the army and the propaganda of Lenin's followers. These extreme revolutionists insisted on Russia's making peace with Germany as the first step toward the establishment of a truly representative government. They gained control of affairs on 7th November, 1917.

The followers of Lenin were joined by the



MODERN RUSSIA

1. Gate-way in the modern style. 2. Near Liamtsevo, in the county of Bronintsv near Moscow, a typical peasant village. 3. Street scene. 4. Sanatorium in the Crimean peninsula for trade union members. It is dedicated to Karl Liebknecht, a noted revolutionary.

Photos: Society for Cultural Relations, OROX.

young son, naming his brother, Grand Duke Michael, as regent. The Ministers connected with the old *régime* were deposed, some of them were imprisoned, and the government of Russia came under the control of the Duma and a responsible Ministry.

Encouraged by the allied leaders, the provisional government attempted to keep the nation at war. But the effort failed, and the demoralized Russian troops were in full retreat by the latter part of July. At home, meantime, Nikolai Lenin, a radical leader and advocate of a separate peace, had attempted to overturn the government, but at this time his effort was unsuccessful. Kerensky became Premier on 22nd July,

radicals of the peasants' revolutionary party, and the two united under the name *Bolsheviks*. This term, meaning "those of the majority," was originally adopted by the Leninites in 1903. See *BOLSHEVIKS*.

Russia under Bolshevism. The All-Russian Congress of Workmen's and Soldiers' Delegates selected a new Cabinet on 9th November, with Lenin as Premier and Leon Trotzky as Minister for Foreign Affairs. Lenin began at once to carry out his radical programme, and Trotzky to reorganize the army for the protection of the revolution. Decrees were issued placing the workmen in control of the factories, private ownership of land was abolished, and mines, forests,



A RUSSIAN ORCHESTRA

Photo: Society for Cultural Relations

and waterways were taken over by the State. Lenin sent envoys to Brest-Litovsk, who signed there, on 3rd March, 1918, a treaty by which Russia relinquished its sovereignty over Estonia, Livonia, Courland, Finland, Poland, and the Ukraine. The Soviet Congress ratified the treaty, but Germany's defeat in November, 1918, caused the nullification of the entire agreement. Meanwhile, on 16th July, 1918, the deposed Tsar, Nicholas II, and all of his family had been murdered.

A powerful anti-Bolshevik faction in Siberia aided by Czechoslovakian troops, set up a so-called All-Russian government at Omsk, which Trotsky's well-organized "Red" army defeated. Another strong anti-Bolshevik centre, in South Russia, was eventually brought under Soviet control. Russia now made boundary agreements with Estonia, Lithuania, Latvia, Finland and Poland. With the latter country there was a brief war over the frontier question. See POLAND.

The years 1920 and 1921 were extremely difficult for the new régime, because of the utter demoralization of transport and industrial systems, and the acute discomfort of the impoverished people. In 1921 famine swept over great sections which normally

produce abundant crops of grain, and thousands died of starvation and disease. That same year, however, witnessed the inauguration of the New Economic Policy (N.E.P.), which virtually restored capitalist control to the factories and peasant control to the farms. Russia now experienced a gradual economic recovery.

As an aid to stability, a Five-Year Plan

for National Economic Construction was put into effect 1st October, 1928. This resulted, in spite of various difficulties, in increased production (see below). Though the Soviet government is, in theory, committed to the programme of working against capitalism throughout the world, it seeks the recognition of foreign governments and



THE RUSSIAN STAGE

Scene 2 from a production of *Saint Joan* by Tairov at the Karpkerny Theatre.

Photo: Society for Cultural Relations

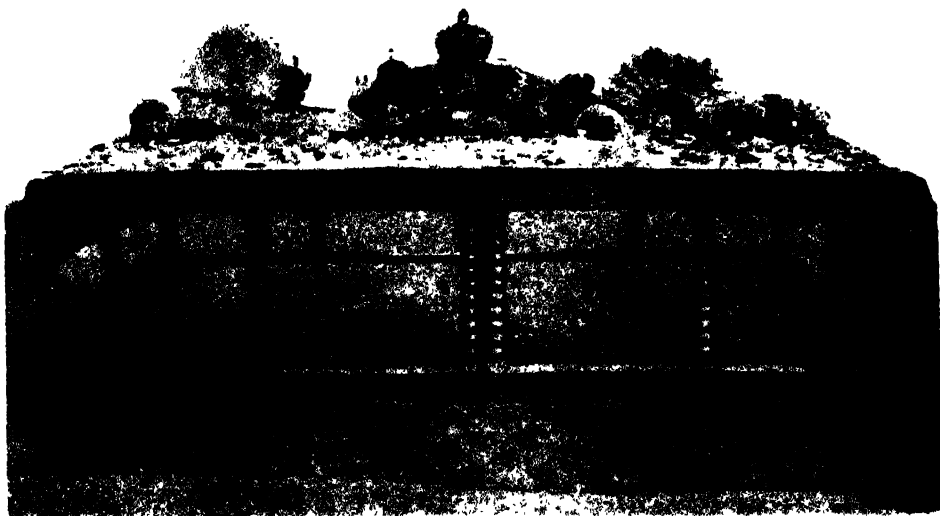
the resumption of normal diplomatic relations. In 1929 such relations were maintained with the following countries: Austria, Czechoslovakia, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Latvia, Lithuania, Norway, Poland, Sweden, Mexico, Afghanistan, China, Hejaz, Japan, Mongolia, Persia, Turkey, and Great Britain. Great Britain broke off diplomatic relations with the Soviet government in May, 1927, but in 1929 resumed them. Russia became a member of the League of Nations in 1934.

Lenin died in 1924, and Alexis I. Rykoff was named his successor, with the titles

continuously, so that one-fifth of the personnel enjoys a day of rest every day in the week.

The Gregorian calendar used by most other nations is used in Russia. There are only five national holidays, 22nd January, 1st and 2nd May, and 7th and 8th November.

In 1929 war with China over the control and operation of the Chinese Eastern Railway seriously threatened, but after considerable bloodshed, peace was restored. The Japanese occupation of Manchuria in 1932-1933 led to new railway building in Eastern Siberia, designed to secure a route



THE CROWN JEWELS OF THE FORMER TEARS OF ALL THE RUSSIANS

Photo - Wide World

Premier and Chairman of the Council of People's Commissars of the U.S.S.R. Joseph Stalin, Secretary-General of the Communist Party, however, had risen to importance in the Soviet government by 1926, though he held no executive position. Trotzky was exiled in 1927, because of his opposition to the restoration of a degree of capitalism, implied in the N.E.P. The more moderate views of Stalin prevailed, and it was he who now became in fact a dictator. The collective farms have since been granted the use of land in perpetuity, and some private property in land is allowed.

After October, 1929, Saturday and Sunday disappeared from the Russian calendar. An uninterrupted week for industry was decreed by the Council of People's Commissars (the equivalent of the usual cabinet). The new rule requires four workdays of seven hours each, and provides for rest and recreation on each fifth day; then the next week starts. Offices and plant are open

to Vladivostok well within Russian territory. Russia has in recent years established a virtual protectorate over Outer Mongolia and has great influence in Sinkiang.

In 1933 the second Five-Year Plan was started. Emphasis was placed on the light industries, such as the production of textiles, clothing, and all articles of immediate use to the people.

The international aspect of Communism, seen in the fiery propaganda of early days and in the subsidy sent by Moscow to the British miners in 1926, has been less in evidence of recent years—its abandonment, at any rate overtly, being the price of Russia's re-entry into the circle of nations and of her recognition by Britain, the United States and other countries. Stalin has hitherto been unwilling to provoke Germany or to lose the friendship of France, with whom a Pact of Mutual Assistance was concluded in the spring of 1936. That the current of internationalism runs strongly

under the surface is witnessed by the sympathy and assistance given to the Spanish Socialist government when hard pressed by the Nationalists. Relations with Fascist countries have shown some deterioration, and the hope for a measure of peace in Eastern Europe lies mainly in the system of alliances involving the states which now widely separate Russia and Germany.

RUSSIAN LANGUAGE. The most prominent among the Slavonic languages. Its present form dates from about the sixteenth century, although manuscripts written in primitive Slavonic show Russian forms as early as the twelfth century. Modern Russian was fully developed by the beginning of the nineteenth century.

There are three principal dialects: *Great Russian*, which is the literary and official language, *Little Russian*, used in Southern Russia, and sometimes called Ukrainian; and *White Russian*, which is used in Western Russia and shows Polish influences.

The language is highly inflected, in this respect being nearer to Latin and Greek than to the languages of Western Europe. There are six cases for nouns, three genders, three tenses, two sets of endings for adjectives, and two varieties of participles. Compounds and derivatives are freely used, and the order of words in a sentence is not fixed, as the form of a word shows its relations to others. Variations in accent are prevalent. These characteristics make the language difficult for a foreigner to acquire, but give it great flexibility and expressiveness.

RUSSIAN LITERATURE. From a country which had its beginnings in the ninth century, it would be natural to expect an old, well-established literature, but not until the nineteenth century did a Russian literature appear which commanded world interest. During the early centuries, Russia's literature was made up of folk tales and songs, carried by wandering singers from east to west, and by word of mouth from generation to generation. Some tales are Slavic, some, the *byliny*, are epic songs akin to the Scandinavian sagas; some show their Aryan origin, and others the influence of the Far East. All the early history—the Vikings, the Mongol invasion, the growth of the Russian cities and of the nation—is to be traced in the vast store of folk literature. The *byliny*, which have been called "history set to music," have been of service in maintaining a unity of spoken language, and also a native music which to-day makes the works of the Russian composers such as Rimsky-Korsakov, Borodin and Mussorgsky appeal to the nation because their music is based on the songs of the people.

From the tenth to the twelfth century,

there were various centres of development each of which had its *annals*, or records, crude attempts at writing history. The most complete and the best-known is the *Chronicle of Nestor* (sometimes called the *Chronicle of Kiev*). This chronicle and an epic poem, *The Campaign of Igor*, based on the march, in 1185, of Igor of Novgorod against the Polovtsi in South-eastern Russia, are the earliest contributions to recorded literature in Russia.

The medieval period saw the Mongol invasion and later the growth of Moscow as a powerful military State. Nothing remains from this period save a few ecclesiastical writings and the remarkable diary of an exiled priest, Avvakum. The story of his journey to Siberia and his return, in 1681, to be burned at the stake, was a model for all Russian memoirs.

The seventeenth and eighteenth centuries serve as a prologue to the great age of Russian literature. During it, Peter the Great gave Russia an alphabet by which the spoken language could be written. Lomonosov, philosopher, chemist, geographer, the most prominent figure of this period, laid the foundations of Russian grammar. The Russian theatre was established, and the plays, although they were modelled upon the French, were Russian in setting. The poet Zhukovsky gave Russia translations of Greek, English, and German classics, and the historian Karamzin (1766-1826) first awakened Russian national consciousness and a lasting interest in the history of the nation. His *History of the Russian State* was so brilliantly written that the first edition of this eight-volume work (1000 copies) sold in twenty-five days. By the end of the century, Russia, thanks to Peter the Great and Catherine II, had taken its place among the European nations, and the stage was ready for a truly Russian literature.

Russian literature in the nineteenth century—the so-called "national period"—was the outcome of political conditions. Under an absolute Tsarist rule, politics were banned and literature became the substitute. Literary schools took the place of political parties. There were the Westerners, who wanted European methods, and the Slavophiles, who wanted a reformed, patriarchal Tsarist system. Later, these parties gave way to the Marxists, who thought the industrialization of Russia the only course and the workers the only salvation, and the Narodniki, who felt the peasant and the communal village life the proper social ideal for Russia. Many writers at this time suffered exile and imprisonment for their political views.

In this period, the first great figure is

Pushkin, the founder of modern Russian literature. He is followed by a group of poets, Lermontov, Krylov, Nekrasov. With the advent of Gogol begins the period of the realistic novel, in which Russian literature reached its greatest height in the novels of Dostoevsky and Tolstoy. In the realistic novel there are certain outstanding features: character predominating over plot; the "slice of life" type of story; a subject chosen from contemporary life, and a definite ethical outlook. The Russian novelist interests himself in some problem, usually a problem of conscience, rarely one of action. Along with the novel grew the drama, criticism, and philosophy, to make this the golden age of Russian literature. Among Russian dramatists the name of Tchekhov (1860-1904) is the best known.

The great writers of the era are dealt with in separate articles. The following are other well-known authors of the nineteenth century—

Goncharov, *gahn' chà rof*, IVAN (1812-1891), a novelist famous for his *Oblomov*, which exposed indolence as the curse of the Russian middle class. "Oblomovism" came to mean fear of living, of working, of loving, lest peaceful existence be disturbed.

Griboyedov, *gre bah yed' of*, ALEXANDER (1795-1829), the author of the distinctive Russian comedy of the period, *Misfortune from Intelligence*.

Herzen, *heri' sen*, ALEXANDER (1812-1870), writer of political articles, and of memoirs written in a style of unequalled beauty. His best works are *Whose Fault is it?* a novel; *From the Other Shore*; and *Past Facts and Thoughts*.

Krylov, *kre' lof*, IVAN (1768-1844), translated the fables of La Fontaine into the Russian vernacular, thus helping to establish it as the literary language.

Lermontov, *lyair' mon lof*, MIKHAIL (1814-1841), wrote many beautiful poems which won him the title "poet of the Caucasus." His best works are an epic poem, *Song about the Merchant Kalashnikov*, many lyrical poems, and a novel in prose, *The Hero of Our Own Times*.

Merezhkovsky, *mer resh kof' she*, DMITRI (born 1865), novelist, critic, and poet, a religious mystic, best known for his historic trilogy, *The Death of the Gods* (the story of Julian the Apostate); *The Resurrection of the Gods* (the story of Leonardo da Vinci); and *The Antichrist* (the story of Peter the Great and his son).

Nekrasov, *nyek ras' sof*, NIKOLAI (1821-1877), a poet, familiar to us for his *Who can be Happy and Free in Russia?*

Ostrovsky, *ahs trof' she*, ALEXANDER (1823-1886), the founder of the modern

Russian comedy and drama. The two plays by which he is best known, and which are still played, are *The Storm* and *Poverty is no Crime*.

Saltykov, *sahl tek kof'*, MIKHAIL (1826-1889), a satirist who wrote under the name of NIKOLAI SHCHEDRIN. His most important works are *Provincial Sketches*, *History of a City* (a satirical history of Russia), and *The Family Golovlev*.

Sologub, *sol' o goop*, FREDOR (1863-1927), the pen name of FREDOR TETERNIKOV. *Lyrical Poems*, *The Little Demon* (his most popular novel), and *The Sweet-Scented Name* are the works generally known to English readers.

With the death of Turgenieff and Dostoevsky, the period of Russia's literary giants ended, and the new period began. Twentieth-century literature became for some time extreme, brutally realistic and morbidly interested in sex and disease; if the former period saw the growth of the psychological novel, it could be said that this was the period of the pathological novel.

The following are among the best known of modern Russian writers—

Andreyev, *ahn dray' ef*, LEONID (1871-1919), a brilliantly original writer, neither realist nor romantic, but a mystic whose philosophy was fatalism. *The Red Laugh* is a terrible protest against war; other stories are *The Seven who were Hanged*, *Sava*, and *Judas Iscariot*. *Anathema* and *He who Gets Slapped* are well-known plays.

Artsybashev, MIKHAIL (1878-1927), was best known for *Sanin*, a sensational anti-Christian novel which preaches personal happiness as the aim of life.

Kuprin, ALEXANDER (born 1870), a writer of stories and sketches alive with joy and activity. He is a direct literary descendant of Turgenieff and Tolstoi. *The Duel*, *The Pit*, *A Bracelet of Garnets*, and *Stories for Children* are among his best works.

Savinkov, BORIS (1879-1925), a modern realist who wrote under the pen name V. ROPSHIN. He represented, in *The Pale Horse* and *What Never Happened*, the school of writers disappointed in the revolution and impressed by the tragedies of warfare.

See DOSTOIEVSKY; GOGOL; GORKY; KROPOTKIN; PUSHKIN; TCHEKOV; TOLSTOY; TURGENIEFF.

RUSSIAN SOVIET FEDERATED SOCIALIST REPUBLIC. The official name of the largest state of the Union of Soviet Socialist Republics. See RUSSIA.

RUSSIAN TURKESTAN. See TURKMEN SOCIALIST SOVIET REPUBLIC.

RUSSNIACS. See RUTHENIANS.

RUSSO-JAPANESE WAR. Lasting from 10th February, 1904, to 5th September,

1905, this war established Japan's position as a first-class Power and its dominance in the Far East. The immediate cause of the war was Russia's attempts at commercial expansion. Handicapped by lack of harbours clear of ice throughout the year, Russia attempted to extend her influence in Korea. Japan had large commercial interests there and also many settlers. Further, the safety of the island empire would have been threatened by Russian domination in harbours so close to Japan itself. Japan asked for the independence of Korea and Manchuria to be recognized, but the negotiations failed and war followed. The Japanese forces immediately available were the greater, but Russia had greater reserves both of men and capital. Japan therefore forced the fighting and was almost continuously successful, but at heavy cost of men and money. Long-drawn-out battles round Port Arthur and Mukden ended in the capture of those cities, and in May, 1905, the Russian fleet was annihilated in the strait of Tsushima. Both sides were ready to discuss terms when Theodore Roosevelt, President of the United States, proposed negotiations. Russia ceded to Japan the southern half of Sakhalin, surrendered the lease of Port Arthur, and agreed to withdraw its troops from Manchuria and to recognize Japan's sphere of influence in Korea.

RUSSO-TURKISH WARS. The many wars between Russia and Turkey cover a period of about 350 years. The first contest lasted from 1569 to 1571, and was an attempt to arrest the southern progress of Russia. In 1709 Charles XII of Sweden, after defeat at the hands of Peter the Great, incited the Turks to attack, and in 1711 Russia surrendered Azov to Turkey. The struggle of 1768-74 freed Southern Russia and placed the Orthodox Christians in the Sultan's domains under Russian protection. The war of 1787-92 extended Russia's boundary to the River Dniester. The nineteenth century saw four wars. The first (1806-12) extended the Russian boundary from the Dniester to the River Pruth. The second (1828-29) forced Turkey to recognize the independence of Greece, opened the Dardanelles to Russian merchant shipping, and made the provinces of Moldavia and Wallachia Russian protectorates. In the third war (the Crimean, 1854-56) Turkey regained part of Bessarabia. In the fourth war (generally known as the Russo-Turkish, 1877-78) the Russians employed trench warfare and won back what the Crimean War had lost.

RUST. A brownish-red substance that forms on the surface of iron and steel when they are exposed to a damp atmosphere.

The term without modification means *iron rust*, which is a compound of oxygen and iron, chemically known as the red oxide of iron. Rust is formed by the union of the oxygen of the air with the iron, a process called *oxidation* (which see), and moisture is an important agent in producing the change. When rust is formed, the surface of the metal is corroded, so that a polished surface is made rough. Rust not only corrodes the surface, but it weakens the metal. Long exposure to air and moisture, for instance, will cause nails to rust away, and rust frequently eats holes through sheet iron.

Rust may be removed from iron and steel by scrubbing with water, or by the use of flour of emery or, in extreme cases, with a grindstone.

RUSTS. A large group of parasitic fungi occurring on seed plants and ferns. Rusts are especially injurious to cereal crops (see FUNGI). The name refers to the brownish spores produced by typical rusts, which somewhat resemble iron rust. Five different kinds of spores are borne by rusts, though not all are produced by every species. Each kind of spore represents a stage in the life-history of the particular rust. One of the species that attacks wheat affords a good illustration of a typical rust.

This species is called the *black stem rust*. In the spring, small cup-like organs filled with spores appear on the lower side of the foliage of the common barberry. These spores are carried by the wind to wheat plants, and, entering the tissues, produce crops of reddish spores during the growing season. The new spores, in turn, are carried to other wheat plants, stunting their growth and withering the grain. At about harvest time, blackish, two-celled resting spores are produced on the stalks and stubble. These germinate in the spring, and their crop of sporidia attacks barberry plants. Thus a cycle is completed, and a new cycle begun.

Fungoid rusts attack a number of garden plants, such as tomato, onion, mint, anthurium, etc. The only certain cure is to burn infected plants or portions of plants.

RUTH. Name of a book of the Old Testament, of unknown authorship. It is a narrative of Hebrew rural life "at the time when the judges ruled." Ruth is also the name of the heroine of the story. She was a Moabitess, the widow of an Israelite whose family had taken refuge from famine in Moab. Ruth's affection for Naomi, her husband's mother, and her loyalty to the family into which she had married are revealed in her answer to Naomi's plea that she return to her own home.

Ruth's fine qualities came to the notice of Boaz, a landowner of Bethlehem, in whose fields she gleaned. As a kinsman of Naomi, he showed her many acts of courtesy and later made her his wife. Thus she became the great-grandmother of King David, and direct ancestress in the Messianic line.

RUTHENIA, *ru the' nia*. A district of Eastern Europe which, until the creation of the Czechoslovak state, was part of Russia. It has an area of 4870 sq. miles and a population of about three-quarters of a million; it is mainly mountainous, being part of the Carpathians. Peasant agriculture and stock-rearing predominate, and the Ruthenians have much in common with the Ukrainians, who are within the Soviet Union to the east. See following article.

RUTHENIANS OR **RUSNIACS**, *rus' ne aks*. A Slav people which now occupies vast territories in the east of Europe. They were called *Scythians* in ancient times; in the thirteenth century and during various later periods they were called *Little Russians*, to distinguish them from the *Great Russians* of the Moscow region. They number about 10,000,000, and their home for many centuries has been in Galicia, now part of Poland, and in the Ukraine, an independent state of the Soviet Union. Many Ruthenians also live in the present Rumania, especially in the province of Bucovina; in Czechoslovakia, and in Russia generally. Unlike the Poles, they are a peace-loving people.

The Ruthenians speak the Russian language, for though they have a Ruthenian tongue, campaigns of Russianizing have tended to suppress it. Most of them belong to the Greek Catholic (Uniate) Church, which acknowledges the Pope, while retaining the Slavonic liturgy.

During the Tartar invasions, which drove the Little Russians westward, they established themselves in Galicia about 1340. They were originally peasants, and when serfdom began in the northern countries, many of them fled to the borderland—the Ukraine. Consequently, *Ukrainians* and *South Russians* came to be other synonyms for *Ruthenians*. In the partitions of Poland (1772 and 1793-5), ethnological frontiers were disregarded. Russia took over all the Ukraine except Eastern Galicia, which went to Poland, and part of Bucovina, which Austria received and was compelled to relinquish to Rumania following the World War. Russia began at once an active programme of Russianizing, while Austria sought to placate the Ruthenians to offset the Polish influence which had so long dominated them. Hope rose high among the Ruthenians when Austria granted them moral and political rights, and the Austrian

city of Lemberg (now in Poland) came to be the centre of Ruthenian learning and national life. However, their vision of a united and independent Ruthenian State soon faded.

At the beginning of the World War, Russia occupied Galicia and made a serious attempt to bring the Ruthenians under Russian domination. Later, the Tsar's army was driven out by the Central Powers, which sought the support of the Poles by promising them a reunited country. The Ruthenians of Galicia became alarmed at the prospect of subjection to Poland, and during the chaos which followed the Austrian collapse, the Ruthenians set up a separate State and joined the Ukraine. Poland, however, refused to admit the national claims of the Ruthenians. Lemberg was taken on the ground that it was predominantly Polish, and in December, 1919, East Galicia was awarded to Poland for a term of years. Though the Ukraine emerged from the struggle as an autonomous republic in the Soviet Union, the long-cherished hope of a united Ruthenian nation was destroyed. See **UKRAINE**.

RUTHENIUM, *ru the' nium*. A rare metallic element, belonging to the platinum group, discovered in 1846 by Claus in platinum and osmium ores. Its chemical symbol is *Ru* and atomic weight 101.7, and it has a high melting-point of 2500° C., being one of the most refractory metals. Ruthenium is a hard, brittle metal which, when pure, is more easily oxidized than platinum or silver. Owing to its power of absorbing gases it acts as a strong catalyst, and one of its compounds, the ammoniated oxychloride, known as Ruthenium Red, is used as a staining agent in the microscopical examination of tissues.

RUTHERFORD, SIR ERNEST (born 1871). British physicist. His researches established the existence and nature of radio activity (which see). See also **CHEMISTRY**.

RUTHERFORD, MARK. See **WHILL**, W. H.

RUTHERGLEN. In the county of Lanark to the east of Glasgow, on the south bank of the River Clyde, is the Royal Burgh of Rutherglen (population, 25,157). It was at one time the chief trading centre and shipping port on the Clyde, and had a flourishing shipbuilding industry for over sixty years. To-day the industries of the town and parish are varied, and include the manufacture of tubes, chemicals, paper, steel, rope and twine, bolts and nuts, and chairs.

RUTHIN. See **DENBIGHSHIRE**.

RUTHVEN. Lords of Ruthven who were also Earls of Gowrie figured prominently in tragedies of Scottish history. Their origin

is vague, but they were reputed to be descendants of Thor, a Saxon or Dane who settled in Scotland in the reign of David I. Their enemies attributed to them powers of enchantment and sorcery. Patrick, the third Lord Ruthven, was born in 1520. In 1563 he was a councillor to Mary Queen of Scots. A Douglas, and close relative of Lord Darnley, he resented the rise to favour of Rizzio and was one of those who planned the seizing of Rizzio on 9th March, 1565. At the supper-table that night, when Rizzio took his seat at table beside the Queen, Ruthven commanded Rizzio to leave, "as it was no place for him." Rizzio clung to the Queen's garments; but others of the conspirators crowded in, removed Rizzio from the supper room, and murdered him. Lord Ruthven died three months afterwards at Newcastle. The fourth Lord Ruthven and first Earl of Gowrie, and his brother the Master of Ruthven, further marked Scottish history with tragedies, although they lived little more than twenty years. The Master of Ruthven became in early youth a gentleman of the bedchamber to James VI of Scotland. He was favoured by the Queen and became her lover. A piece of ribbon caused his death. It was given by the King to the Queen; she foolishly presented it to the Master of Ruthven, who wore it over his heart. One day the King, walking in the gardens of Falkland Castle, came across Ruthven asleep, with his doublet open and showing this piece of ribbon. James VI at once recognized it. That was in May, 1600, and, according to Malcolm Laing's *History of Scotland*, Ruthven was instantly expelled from the Court. On 5th August, 1600, he visited the King at Falkland Castle, and is said to have attacked him with a dagger, according to the King's own account, Ruthven was overpowered, thrown from the room, and killed on the stairs by Sir Thomas Erskine and Sir Henry Herries. The Earl of Gowrie, who came on the scene just after his brother's death, was also killed by the King's protectors. On the following day the Privy Council ordered the arrest of the Earl of Gowrie's two surviving brothers, but they escaped to England. On 20th November following, the Scottish Parliament ordered the forfeiture of the Gowrie estates and the extinction of their name and honours.

RUTILE, *ru' til*. A reddish or yellowish red mineral that sometimes occurs in transparent quartz in the form of hairlike crystals. It imparts to the quartz the appearance of having coloured threads extended through it. Rutile occurs in large masses in Norway, Quebec, Australia, and Virginia, U.S.A. It is employed for imparting a yellow colour to glass and porcelain, and some of the finest

specimens are polished and set, forming beautiful gems. It is a source of the element titanium (which see).

Chemical Formula. Rutile is an oxide of titanium, with the formula TiO_2 ; that is, a molecule contains one atom of titanium and two atoms of oxygen.

RUTLAND. A midland county of England with an area of 97,273 acres and a population in 1931 of 17,397.

Physical Features and Scenery. Rutland is the smallest English county in area, but considering its size it has a pleasant diversity of character. It ranges in altitude from



630 ft in the extreme west to about 50 ft in the east. The highest ground occurs entirely in the west, where there is a continuation of the Leicestershire Wolds. The south-west corner was formerly the Royal Forest of Leughfield, and though the greater part has now been turned to agriculture, Beaumont Chase remains as an indication of its past character.

North of Oakham the high land extends eastward over the whole width of the county, forming an elevated plateau with a mean height of about 400 ft. above sea level. Here, although the variety of hill and dale is lacking, the country is more intensively cultivated. The southern half of the county, by contrast, is composed of a series of valleys and ridges which spread eastward from the highlands of the west. In the west central part is found some of the most fertile country, including the Vale of Catmose.

The characteristic feature of the whole county is the red tinge of the ploughed land, which, according to some authorities, is the origin of the name Rutland, supposed

to be a confusion of "red land." The landscape is also well known for its large number of picturesque villages, in most cases compactly grouped round the parish church, which are more reminiscent of feudal England than those of any other single district. The principal and only important river of the county is the Welland, which forms the southern and south-eastern boundary for a distance of about 16 miles. Throughout its course it is bordered by a broad strip of meadow land, which suffers often from extensive flooding. Its principal tributaries are the Chater and the Gwash, which both rise in Leicestershire and follow a parallel course eastward across the county.

History and Antiquities. The history of Rutland can scarcely be distinguished from that of the neighbouring shires. In fact, it was not one of the original shires and did not attain the status of a county until the beginning of the thirteenth century.

There is little evidence of prehistoric habitation, although a few flint instruments, probably of the Neolithic Age, have been discovered at Great Casterton.

At the time of the Roman invasion the area was included in the land of the Coritani, but here again there is little positive evidence, for the hill-top camps which exist in most other parts of the country do not occur in Rutland. One Roman road, Ermine Street, traversed the county, and near it, at Market Overton and Great Casterton, there are traces of earthworks which may represent Roman fortifications. A remnant of

dwelling-place. The castle hall has been converted into an Assize Court, but the banqueting-hall, the walls and part of the fosse remain intact. Burley House is a modern residence, but nearby is a mound that marks the site of another medieval castle. The manor-house of Ryhall, though



RUTLAND
Bede House, Lyddington.
Photo Taylor

fallen from its former estate, was erected in the thirteenth century for Hugh le Despenser. The groined roof is of very early date. Toilethorpe Hall is another ancient manor-house, much restored, but dating in part from the fourteenth century. Exton Hall, the most picturesque seat in the county, was built in the reign of Elizabeth.

The chief events of national importance which have taken place within the county have been the Battle of Empingham, during the Lincolnshire rising of 1470, and the siege of Lutteringham during the Civil Wars, when the town was captured by the Parliamentary force after a short resistance.

At the present time, for parliamentary purposes, the county is included in Lincolnshire, and one Member is returned by the Rutland and Stamford Division.

Agriculture and Industries. To-day Rutland is purely an agricultural county. Its industries, with the exception of stone-quarrying on a small scale, and a single boot factory at Oakham, are of historic interest only. Formerly, the staple industry was the wool trade, which arose during the "peaceful invasion" of Flanders wool workers during the reign of Edward III. Iron-stone-quarrying is a small-scale occupation of recent introduction.

In agriculture, the county is divided according to its physical characteristics. The west is chiefly pasture land, the east



UPPINGHAM SCHOOL.
The main "quad" and entrance gate.
Photo Taylor

the later Saxon period is the arch of the tower in Market Overton church.

Rutland formed part of the Saxon Kingdom of Mercia, and, as "Roteland," was given by Edward the Confessor to his queen. The principal medieval castle is that of Oakham, a late twelfth-century fortified

principally arable, the remainder being divided almost equally between the two. Rather less than one-fifth of the total area is occupied by cereals, of which the most extensively cultivated is barley. Wheat, oats and rye are also produced, the latter on a very small scale. Root crops occupy approximately 6 per cent of the total acreage, and there are small orchards. The western uplands are famous stock-raising districts. Lincoln Red cattle are bred for beef and stud purposes, and the county is high in the list of sheep-per-acre production.



"FLET CHAMBER" ABOVE THE PORCH AT
STOKE DRY CHURCH, RUTLAND
Photo George Long

There is some dairy-farming in the neighbourhood of Oakham and Uppingham, whilst Braunston is associated with the manufacture of Stilton cheese.

Chief Towns. The county town is Oakham (which see). The only other town of importance is *Uppingham*; the Rural District has a population of 5292 (in 1931) and an area of 24,735 acres. The church is of Norman origin, rebuilt in the thirteenth century. The well-known public school is situated in the town; this was endowed in the sixteenth century as a free grammar school. Uppingham is an important market town for the surrounding cattle-raising district.

RUTLAND, EARLS OF. The first of these were Plantagenets. Edward of Langley, son of Edward, Duke of York, born in 1373, was knighted by King Richard II, 15th July, 1377, and in 1390 was created Earl of Rutland and seven years later Duke of Albany and Constable of England for life. In 1402 he succeeded as second Duke of

York. Edward Plantagenet, third son of Richard, Duke of York, was made Earl of Rutland in 1459. Thomas Manners, son of George, Lord Ross, born 1491-2, was made Earl of Rutland in 1525. He received numerous honours from King Henry VIII and was Lord Chamberlain to two of Henry VIII's queens—Anne of Cleves and Catherine Howard. Since then the title has remained with the Manners family. John Manners, the third, was created Duke of Rutland, Marquess of Granby, and Duke of Manners. Born in 1638, he bore the queen's sceptre at the coronation of King James II. His son John, who succeeded in 1711, was a Commissioner for the Union with Scotland 10th April, 1706. John Manners the fifth was a Lord Justice of Great Britain and bore the queen's sceptre with the cross at the coronation of King George III, and his grandson, John Henry Manners, bore the sceptre with dove at the coronation of King George IV, 19th July, 1821.

RUWENZORI, OR THE MOUNTAIN OF THE MOON. A block of mountains rising from the floor of the Rift Valley of Central Africa almost on the Equator. Peaks rise to over 10,000 ft.; several are snowcapped and bear glaciers. The range lies on the frontiers of the Belgian Congo and Uganda, and between Lakes Albert and Edward. H. M. Stanley discovered the range in 1887, and other explorers helped to elucidate its problems, and in 1906 the Duke of the Abruzzi explored it from end to end. It would appear to be the range referred to by Ptolemy in 150 as the Mountains of the Moon, a source of the Nile, and lost sight of until the nineteenth century.

RUYSDAEL, OR RUISDAEL, *1611-1681* *dutch* JACOB (about 1628-1682). An artist of the Dutch school of landscape painting. Menno Hobbema alone approached him in this field. Though his canvases often give a suggestion of melancholy because of his fondness for painting clouded skies, dark masses of leaves, and other sombre aspects of nature, his pictures have a charm that comes from poetic and sympathetic treatment. In all of his work the technique is admirable. He painted with equal facility quiet rural scenes, mountainous landscapes and stormy seas.

Ruysdael was born at Haarlem, where he had as a teacher his uncle, Salomon Ruysdael. His best work was accomplished in the period between 1660 and 1675 in the city of Amsterdam. The last years of his life were darkened by poverty and illness, and he died in an almshouse. The best examples of his work include "View of Haarlem" and "Agitated Sea" (Berlin Museum); "Jewish Cemetery" (Dresden

(Gallery); "Landscape with Ruins" (National Gallery, London); "Storm at Sea" (Louvre).

RUYTER, *roy' ter*, or *ri' ter*. **MICHAEL ADRIAANSZON DE** (1607-1676). A Dutch admiral who ranks with the greatest of Holland's fighting seamen. He was born at Flushing, and was a sailor from his boyhood. In 1641, having risen to the rank of rear-admiral, Ruyter took charge of a squadron sent to help the Portuguese against the Spanish; a few years later he was successfully fighting against the Barbary pirates in the Mediterranean. In 1652, when Van Tromp won his victory over Blake in the English Channel, he had Ruyter as his assistant. The latter was given chief command of the Dutch fleet after the death of Van Tromp, and though he was not always successful, he was a hard foe to conquer. He died in 1676 from the effects of wounds received in a battle with the French.

RYDE. See **WIGHT, ISLE OF**.

RYE. A grain closely resembling wheat and barley raised in the cool regions of Europe, Asia, and America. So far as men have been able to discover, rye is a comparatively recent development among the grains, no record of its use in ancient times has been found.

Rye is the hardiest of the cereals, and will succeed where other grains cannot be raised. There are both winter and spring ryes. The winter rye is sown in the autumn and is hardy enough to stand the severe winter conditions of Russia and Canada. The spring rye is raised chiefly for forage in Siberia.

Rye is adapted to light, sandy soils and does not thrive well on heavy, damp soils. While it is not so valuable as wheat for food, its adaptability to a cool climate and a light soil makes it one of the most important food plants of Northern Europe. Russia produces about half of the world's output, and in Germany rye is the chief cereal grown. In Canada it is the second most important crop, with an annual yield of about 470,000 cwt.

Rye flour is obtained by a milling process similar to that used in the manufacture of wheat flour (see **FLOUR**). Three products—bran, shorts, and flour—are obtained. The flour is made into the black bread so generally eaten by the people of Northern Europe. It is more compact and a little less nutritious than wheat bread. The fuel value of rye bread is 1620 calories per pound.

Rye is used in the manufacture of malt and spirituous liquors, especially rye whisky, and in Holland it is employed in the manufacture of Holland gin.

Rye is not used as a grain feed for stock as much as oats, corn, or barley. If fed exclusively, it causes digestive disturbances, and

animals ordinarily do not like it. Rye bran is used as a stock food. It is sometimes used as a cover crop and for green manuring (see **FERTILIZER**). The straw is long, smooth and flexible, and is used in manufacturing, particularly for hats, some grades of paper, mats, and the stuffing of horse collars. In those European countries where thatched roofs are still common, it is extensively employed as a thatch, since it resists decay better than most other straws.

Scientific Name. Rye is one of the cereals which belong to the grass family, *Gramineae*. Its botanical name is *Secale cereale*.

RYE. See **SUSSEX**.

RYE HOUSE PLOT. A scheme devised by a few of the most radical members of the English Whig party in 1683, the purpose of which was to waylay and assassinate Charles II and his brother, in order to place the Protestant Duke of Monmouth on the throne. The deed was to be perpetrated at Rye House Farm, the country place of one of the conspirators. The house which the king occupied at the Newmarket races took fire accidentally, and Charles was thus forced to leave eight days sooner than was expected, which frustrated the assassins' plans. Lord William Russell and Algernon Sidney were among those beheaded, and the Earl of Essex committed suicide in the Tower. Their guilt is perhaps arguable. Rendered desperate by the loyalist revival through the country, they seem to have joined a plot to make Monmouth their puppet king, or perhaps to set up an oligarchy, but they may not have known of the assassination planned by a few fanatics. Both plots constituted high treason. See **CHARLES II (England)**, **MONMOUTH, JAMES**.

RYLANDS, JOHN (1801-1888). An English manufacturer and merchant, one of the original promoters of the Manchester Ship Canal. He gave of his great wealth to various charities, and in 1899 his widow established in his memory what is now the world-famous John Rylands' library in Manchester. See **MANCHESTER**.

RYMER, THOMAS (1641-1713). An English writer, appointed historiographer royal in 1692, in the reign of William III.

He became known to the public of that day as a poet and dramatic critic, but is remembered chiefly as the compiler of the *Foedera*. This great undertaking was the publication of all records of British public transactions from the year 1101. Rymer died after the completion of the ninth volume, but his assistant, using materials prepared by the chief historiographer, published five additional volumes, carrying the work to the end of the reign of James I.

THE WORLD BOOK

Ss

S. The nineteenth letter in the English alphabet. The Phoenician letter from which it was derived was shaped much like a capital *W*, and was called *shin* which meant "tooth." The Greeks turned the letter on its side, and called it *sigma*.

and the Romans, when they adopted it, gradually dropped the lowest line and rounded it into the form of modern capital *S*.

In English, *s* has four sounds: the proper *s*, or "hissing" sound, as in *sit*, the *z* or "buzzing" sound, as in *music*, the *sh* sound, as in *sure*, which is uncommon except before *t* in such words as *mansion*; and the *zh* sound, as in *decision*. *S* is also used with *h* in a very common letter combination, as *sh* in *shave*.

W

SAALE, *sahl*. (1) A river of Thuringia, Germany; length 220 miles. (2) A river of Franconia; length 70 miles.

SAAR OR **SAARPFALZ**. A German district bordering on France and lying around a tributary of the Moselle. Its area is 738 sq. miles; its population, 810,987 (1935), most of whom are German-speaking. It was formerly a part of Prussia and Bavaria.

Under Section IV of the Treaty of Versailles, Germany ceded to France full possession of the coal deposits and mines in the Saar territory, whose borders were defined in the treaty. This was in compensation for the German destruction of the coal mines in Northern France, and as part payment toward the total reparations, and was for a term of fifteen years.

A governing commission of five, including one Frenchman, one German inhabitant of the Saar, and three of other nationalities, exercised the authority of the League. In January, 1935, in virtue of a plebiscite to decide the future government, the Saar once more became German territory.

The output of coal in 1934 was 11,317,000 metric tons, and of coke 2,179,000 tons. The Saar coalfield extends also into France, but the coal is at a great depth and is little worked.

The chief town is Saarbrücken (population 129,000). Iron, steel, glass, and chemicals are manufactured. It is at the head of navigation of the Saar and has canal connection with the Rhine-Marne canal. Other large towns are Saarlouis, Merzig, Neunkirchen, St. Ingbert and Ottweiler.

SABATINI, *sab a te' ne*, RAFAEL (1875). An Italian author of roman.

English. Jesi, a small Italian village, his birthplace, but he married an English woman and became a British subject. *The Sisters of Yvonne*, a rather mediocre historical novel, appeared in 1902. It was followed by a novel a year, well-woven plots gained him a wide reputation.

The volumes most read among English-speaking people are *Scurramouche* and *The Sea Hawk*.

SABBATH. The seventh day of the Jewish week, dedicated to God as a day of rest.

The keeping of the Sabbath is enjoined in the various codes in the Old Testament and the writer of the story of the Creation assigned its origin to the "resting" of God after the six days of "work." At first Sabbath keeping was probably limited to observing certain restrictions, but the religious and the philanthropic aspect developed with the advance of Jewish thought, it came to be looked upon as a merciful provision to save men from an unrelenting round of toil, and as a day dedicated to God for



RAFAEL SABATINI
Photo L. G. L.



ON THE RIVER SAAR

The Salient at Mettlach is a well-known beauty spot

Photo German State Railways

worship. To these ends the restrictions were directed.

Gradually these religious and humane aspects of the custom lost their simplicity, and came to be overlaid with ceremonial observances and elaborated with trivial rules.

Christ's view of the Sabbath is made plain both by His actions and by His words "The Sabbath was made for man." To do good on the Sabbath day was lawful. He Himself "kept" the Sabbath day by synagogue worship.

The Christian religion has modified the Sabbath for its followers. Sunday—the day of the Resurrection, the "Lord's day"—is observed by Christians as a day of worship and rest.

SABINE PASS. See below.

SABINES, *sab'inz*. An Italian people. According to legend, after Romulus had built Rome, he sent embassies to the neighbouring cities to ask that his people might take wives from among them. When his request was refused, he planned to invite all the surrounding people to an elaborate entertainment. In the midst of the games, the Romans violated the laws of hospitality by seizing the young women. After engaging in prolonged hostilities the two nations were combined as one, the

Sabines settling on the Quirinal Hill.

SABLE, *sav'bl*. A small mammal belonging to the fur-bearing group of animals, the weasel family. It is native to Siberia and is hunted principally for its valuable pelt. The sable is usually not over a foot and a half in length. Its fur, which covers even the feet and soles, is a lustrous dark brown, with greyish-yellow spots on the sides of the neck.

The animal is caught in



RAPE OF THE SABINE WOMEN
Group by Grambolina

Photo F. V. T.

traps especially designed to prevent injury to the fur.

Scientific Name. The Siberian sable belongs to the family *Mustelidae*. Its scientific name is *Mustela sibirica*.

SACCHARIN, *sak' a rin*. A white odourless powder, a product of coal tar, which, when pure, is several hundred times sweeter than cane sugar. It was discovered in 1879 by Dr. Fahlberg, a German scientist, and Ira Remsen, a noted American chemist. It is sold usually in tablet form. Saccharin dissolves very little in cold water, somewhat more in hot, and is thoroughly soluble in alcohol. Although saccharin is so much sweeter than sugar, it is in no sense a sugar substitute, because it has no food value. Medicinally it is valuable for use in diseases such as diabetes where sugar is harmful.

SACHS, *sahks*, HANS (1494-1576). A German poet, greatest of the Meistersingers. He composed over 6000 tales, hymns and songs, showing both sentiment and humour.

SACKVILLE, GEORGE, FIRST VISCOUNT (1716-1785). Son of the first Duke of Dorset, he entered on a military career which was attended with considerable success as far as promotion was concerned, for by the age of 41 he was lieutenant-general, though apart from Fontenoy, where he was captured by the French, he saw no active service, and his time was largely taken up by politics. Not only did he hold office in the Irish Parliament as Secretary for War, but was a member of the English Parliament as well.

During the Seven Years War he became Commander-in-Chief of the British forces and by his conduct turned Minden from an allied success to an indecisive battle (see SEVEN YEARS WAR). For this he was court-martialled, stripped of his honours, and dismissed the service. His political influence, however, gained him reinstatement, and in 1775 he became secretary for the colonies. In this position his obstinacy and incapacity were the main causes of the British defeat in the Revolutionary War.

SACKVILLE, THOMAS, 1ST EARL OF DORSET (1536-1608). Son of Sir Richard Sackville; born at Buckhurst in Sussex, educated at St. John's College, Cambridge, and called to the Bar at the Inner Temple. He entered Parliament at the age of 22 and was raised to the peerage as Baron Buckhurst in 1567. He filled a number of legal and diplomatic offices, including that of Commissioner at State Trials and that of Ambassador to France and the Low Countries. He was made Chancellor of Oxford University in 1591. He presided at the trial of the Earl of Essex in 1601 and was created Earl of Dorset by King James I in 1604.

In addition to being a courtier, a lawyer,

and a politician, Sackville was also a man of letters. He wrote the *Induction*, or introductory poem for the popular miscellany of versified tales entitled *The Mirror for Magistrates*, published in 1562. In this poem his indebtedness to Dante is manifest. Sackville also collaborated with Thomas Norton in writing *The Tragedy of Gorboduc*, famous as the first regular English tragedy written in blank verse (1562). This play in five acts, modelled on Seneca, is important in the development of English Literature, because it determined the general ground-plan which was adopted by the later Elizabethan dramatists.

SACRAMENT. This word, derived from the Latin *sacramentum*, had as its original meaning something "dedicated," "set apart." In the earlier Christian writings the term was used for almost anything—action or word—definitely connected with religious observance. But it soon came to be narrowed down to signify certain rites of which Baptism and the Eucharist were the chief. The Catholic Church recognizes five others as Sacraments, viz. Confirmation, Penance, Unction, Orders, and Matrimony, but Protestants accept only the former two.

In the matter of the significance of the Sacraments, in themselves, the difference between the Catholic and the Protestant view may roughly be described as follows. Both consider a Sacrament to be a sign, but the Catholic believes it to be an *efficacious* sign, i.e. that it confers a spiritual gift or grace appropriate to itself, whereas the Protestant holds it to be no more than a symbol to the believer of a religious truth.

SACRIFICE. The offering of some object to the deity in acknowledgment of his authority, and to please him or placate his anger.

The sacrificial principle runs largely through the religions of mankind. It is found in the earliest worship of primitive people, and also in the elaborate systems of the civilized pagan nations of antiquity, Babylonians, Egyptians, Greeks, and Romans. In the monotheistic worship of the Jews sacrifices had their essential part, and one of the fundamental doctrines of Christianity is Christ's Sacrifice of Himself upon the Cross, which according to Catholic doctrine is continued in the sacrifice of the Mass.

Religious sacrifices can be divided into two kinds, the bloody and the unbloody, i.e. of animals, and of the fruits of the earth. Both were looked upon as offerings taken from the belongings of the offerer, and connected with the sustaining of his life. The simplest form of offering was the placing of food and drink in some holy place for the

entertainment of the god. The more elaborate sacrifice consisted in killing and burning a victim of which parts were offered and parts were eaten. The idea here is entering into communion with the god. The blood of the victim was then sprinkled upon the altar—the essential feature of the rite—the victim being considered as a substitution for the worshipper, who thus offers his life.

Sacrifices were not only expiatory; there were rites for thanksgiving, praise and



SACRIFICIAL POLE

Erected by the Dyak people of Borneo

Photo. Nederland Linc

petition. In primitive cultures the proper offerer of the sacrifice was the head of the family or tribe, but later the office became limited to a priestly clan, or to priests consecrated for the purpose.

SACRILEGE (Latin, *sacrilegium*) The violation of sacred buildings or objects. Primitive peoples commonly believe that a peculiar magic or taboo is attached to sacred objects, and the person who violates them, even innocently, is thought to be stricken by a curse. This idea disappears with the advance of civilization, but in most legal systems sacrilege continues to be regarded as a special offence for which legal penalties are provided. The Mosaic law on unintentional offences of this nature is laid

down in Leviticus 5, 15, and 16; intentional offenders were stoned to death. In Roman Law *sacrilegium* meant originally the theft of objects consecrated to the gods, but after Christianity became the official religion of the Empire the term was widely extended to cover countless offences against religion, and this wide conception lasted all through the Church law of the Middle Ages and in Catholic countries into quite modern times. In English law it is a felony punishable with penal servitude for life to break and enter by day or night into any place of divine worship and commit a felony therein.

The analogy to burglary (which see) is obvious, and indeed sacrilege was once treated as burglary on the ground that a church is the dwelling-place of God. There are other punishable offences such as brawling in a church, etc.

SACRUM, sak' rum. See PELVIS

SADDUCEES, sad' ū seez. A religious element active in Judea at the time of Christ. Its members held many of the highest offices, and showed a strong inclination toward other than Jewish customs.

Josephus, the Jewish historian, states that the Sadducees "had only the rich on their side, but not the common people." In belief, the Sadducees held to the written law of Moses, but denied the teaching of the Pharisees regarding the binding power of the oral law, the resurrection of the dead, and the current doctrine of angels. See PHARISEES.

SADI, sah' de, or sau' de (about 1184-1292). A Persian poet, born at Shiraz. Under the protection of his patron, the Prince of Fars, he studied philosophy in Baghdad. His patron was deposed by the Mongols in 1226, and Sadi, in discouragement, entered upon a period of wandering which continued for thirty years.

His most important works, both of which were written near the end of his life, are the *Bustan*, or Fruit-Garden, and the *Gulistan*, or Rose-Garden, the former in verse, the latter in prose. Both are made up of discussions of philosophic and religious questions, interspersed with tales and quips. His work in lyric poetry was copious. His were the first Persian writings to be introduced into Europe, and in 1634 Du Ryer translated them into French.

SAFE. A strong-box or chamber for storing money and other valuables against theft or fire. In former times a safe was simply a stout chest strengthened with iron bands and provided with a strong lock, but in these days it is a more complicated structure. In the larger modern types the walls are of cast steel and sheet iron and usually the space between the outer and

inner walls is packed with insulating material and steel rods. The closely-fitting doors are equipped with special locks and bolts and



SAFE-DEPOSIT VAULTS

The door of these vaults at the Midland Bank in Poultry, London, weighs 35 tons.

Photo: Photopress

are very massive in bank vaults and safe deposits.

SAFETY LAMP. A lamp designed to protect miners from explosions of firedamp. There are now many varieties of safety lamps on the market, all based on the principle used by the English chemist, Sir Humphry Davy, in the lamp he invented in 1816. It consists of an oil lamp surrounded by a cylinder of wire gauze of fine mesh, which forms a sort of cage. The heat of the flame will not pass beyond this gauze covering and ignite the gas on the outside until the wire becomes as hot as the flame, and, owing to its good conducting power, it will not become so heated before the miner has time to withdraw from the locality of danger.

One of the chief uses of the lamp is to warn the miner of the presence of the deadly firedamp; the other is to protect him from the danger arising from the presence of this gas. If firedamp invades the workings, it can be detected by lowering the wick, when a pale-blue flame will be noticed about the central flame of the lamp. See FIREDAMP, DAVY, SIR HUMPHRY.

SAFETY VALVE. An appliance attached to steam boilers to allow steam to escape when the pressure becomes too great for safety. See BOILER.

SAFFLOWER. Popular name of a thistle-like plant belonging to the composite family. It is cultivated in India, China, Egypt, and Southern Europe. From its flowers, yellow and red dyes are made. The red dye is used in colouring silks and rouge. The yellow dye is sometimes used to adulterate saffron, but has little value as a colouring matter. Oil yielded by the seeds is used as fuel in lamps and for cooking purposes in the East.

Scientific Name. The botanical name of the safflower is *Carthamus tinctorius*. It belongs to the family *Compositae*.

SAFFRON. An orange-yellow colouring matter and flavouring material obtained by drying the stigmas of the yellow-flowered autumn crocus. Four thousand flowers yield one ounce of commercial saffron. The product has a sweetish, aromatic odour and a bitter taste. It is employed in cookery and to flavour and colour confectionery. Though once widely employed as a stimulant and preventive of spasms, saffron now is little valued as a medicine.

SAFFRON, MEADOW. See COLCHICUM.

SAGA, sah' ga. The name given in Iceland to a traditional form of literature which may best be described as the prose epic. The sagas are narratives, either historical, mythical, or romantic, of the heroes and chieftains of Iceland. Alliteration is common, and verse is often introduced as an ornament.

The sagas were originally preserved orally and were composed to be recited at banquets or other festive gatherings. Most were written in the thirteenth century, though a few are earlier.

Greatest of these compositions is the *Njalssaga*, the saga of law, but the *Eybyggjasaga*, with its store of history and traditions, is also a most valuable work. The romantic *Laxdaelasaga*, the *Gislasaga* and the *Volsungasaga*, which contains the Nibelungen story in prose form, are also notable. See NORWAY, SCANDINAVIAN LITERATURE.

SAGE. A shrubby plant belonging to the mint family, which is cultivated widely as a garden herb. The aromatic stems and leaves whose flavour is due to an essential oil, constitute a widely used seasoning. Sage tea, too, has long been regarded as a stomachic, household tonic, astringent, and aid to digestion. The plant has oval, grey-green leaves and square stems, the flowers, which are blue with white and purple variations, grow in clusters.

Sage is native to Southern Europe. It can be propagated by seed, slips, or cuttings.

Scientific Name. Sage belongs to the family *Menthaceae* (or *Labiatae*). The botanical name of garden sage is *Salvia officinalis*.

SAGHALIN, sah' ga lyen', ISLAND. See SAKHALIN.

SAGITTARIUS, saj' it ar' i us. THE ARCHER. The ninth sign of the zodiac, which the sun enters about 22nd November. It is represented by the sign \nearrow , a dart or an arrow. In mythology, the arrow is the one with which Heracles killed the vulture which devoured the liver of Prometheus when he was chained to a rock as punishment for

having stolen sacred fire from heaven. The archer Sagittarius was, according to the Greeks, Crotus, a centaur, the son of Eupheme, the nurse of the Muses.

The constellation Sagittarius is south of Aquila (the Eagle) in the southern part of the heavens. It contains no bright stars, but has several interesting short-period variables and irregular nebulous masses, with recently a number of novae.

SAGO. A starch contained in the pith of various tropical palms, from which an edible flour, also called sago, is made. The East Indies form the principal source of supply. Sago is similar to arrowroot and tapioca in composition and uses, and large quantities are exported to Europe and North America.

The palms are cut down when they are about fifteen years old, being then just ready to flower. The stems are split lengthwise, from them is extracted the starch pith, which is reduced to a powder by grating. The powder is leached in water over a cloth or sieve, through which it passes to a trough, where it settles. After a few washings the sago flour is ready to be used by the natives in making cakes and soups. Sago prepared for export, however, is given further treatment. The flour is kneaded into a dough by mixing it with water, and the mass is forced through sieves, dropping on hot, greased pans in the form of small grains.

A tree, belonging to the cycad family, whose stems yield starch, is incorrectly called *cycas palm*.

northern part of Africa, from coast to coast, except where it is intercepted by a narrow ribbon of fertility in the extreme east, created



MEMBERS OF A SAHARAN VILLAGE COMMUNITY

Photo: Keystone

by the River Nile. From the Red Sea, the aridity extends eastward into the Arabian Desert. On the north, the Sahara encroaches on the countries bordering the south shore of the Mediterranean Sea, from which it extends southward for distances between 800 and 1400 miles.

The greatest length of the desert is 3200 miles, along the twentieth parallel at north latitude. Its area is estimated at 3,500,000 sq. miles.

The Surface Features. The popular impression of the Sahara makes it a waste of burning, shifting sand throughout its area. Veritable oceans of sand certainly occur, but the desert shows other characteristics. There are great stretches where the surface is hard and rocky, and there is also a central plateau extending three-fourths of the distance across it in a north-east and south-west direction, with an elevation of from 1000 to 2500 ft.

Three mountain ranges, the Ahaggar, the Tibesti, and the Air, rise above this plateau. The highest peaks have altitudes varying from 6000 to over 9000 ft, during the winter their summits are capped with snow. In this mountain region

are numerous river valleys. The Western Sahara is of the rocky nature known as "hamada" and the eastern or Libyan desert is a vast sandy waste of the "erg" type.



CAMEL CARAVAN RESTING IN THE SAHARA

Photo: Keystone

SAHARA. The greatest desert in the world, a medley of barren landscapes, now for the most part under French control. The belt extends in a wide sweep across the



3



4



6

SCENES IN THE SAHARA

1. Bon-saada, a beauty spot on the edge of the desert. 2. Loading baggage camels at an oasis. 3. Low hills in the south. Sandstorms frequently travel up the valleys. 4. Mechanized transport. The car is fitted with caterpillar tractors. 5. Awaiting an approaching sandstorm. 6. Market place, Timbuktu. The desert sands now threaten to cover this town.

Photos. Cherry Kearton; Fox



TYPES OF SAILING CRAFT

1. The Danish training ship "George Sæge" 2. Native craft on the River Nile 3. Australian 18 ft racing cutter in Sydney Harbour 4. Arab Felucca in the Suez Canal 5. Native craft in the harbour at Colombo 6. French crab-boats

Photos: Topical; Fox

The only settled inhabitants of the Sahara proper live on oases (which see)

Except in the oases, the Sahara has very little life. In most parts there is a scanty vegetation of drought-resisting plants. On the borders, where water is obtainable, the lion, the panther, the hyena, the jackal, the fox, and species of baboon are found. The camel, for which the desert is a natural environment, is used for transport.

Climate. The dry climate is due to atmospheric conditions. The prevailing winds bring no moisture or deposit what they have on the Atlas mountains or the West African edge of the plateau. In summer, the days are excessively hot, but the nights are cool. Terrific windstorms blow over the region, carrying great quantities of sand.

Peoples and Commerce. Until a recent date, most of the commerce of the Sahara was carried by camels in caravans, though warlike tribes menaced the routes throughout the central region. The camel will continue to be a means of travel for many years, but better transport is already available for certain districts. Motors frequently cross the Sahara from French Morocco to Timbuktu.

France has officially adopted plans for a Trans-Saharan Railway, but a controversy over routes has been a cause of delay.

Arabs, Moors, Berbers, Tuaregs, Bedouins, Tibus, negroes, and Jews are found in the Sahara. The first-named are along the northern border; Moors are plentiful in the west;

Berbers reach from the Mediterranean coast down into the fringes of the desert, mixing with the Moors, but not amalgamating with them. The Tuaregs are robber bands, the Bedouins are wandering shepherds and herdsmen, and sometimes plunderers, the Tibus are of negro stock, and the negroes proper are descendants of slaves in the oases. The chief articles of trade are salt, silk, ivory, spices, dates, ostrich feathers, and musk.

The population of the Sahara is variously estimated but is probably about 2,000,000. Most of the Sahara is under French political control, but the east is divided between Italy, Egypt, and the Anglo-Egyptian Sudan.

SAIGON, *sā'gōn'* Capital of Cochinchina. See FRENCH INDO-CHINA

SAILS. Research has failed to disclose, and history consequently does not record, who was the first sailor or when the first sail was made. Workmen carrying out excavation work near the coasts of Scotland, in parts of which in earlier days the sea went farther inland than now, have discovered rocks on which, with implements probably made of the horns of wild animals, are cut rough diagrams showing primitive water craft like canoes, bearing, apparently, reed screen forming a sail attached to a pole. The more adventurous on water early man became, the greater was the necessity for utilizing the wind as a means of propulsion. So sails were made and navigation developed.

Sail equipment, with many varieties

according to types of vessels, their size and rig, is somewhat standardized in a full-rigged three-masted ship, which carries: a mizzen Royal, top-gallant, topsail and cross-jack; a main Royal, top-gallant, topsail and mainsail; a fore Royal, top-gallant, topsail and foresail. These are rigged respectively to the mizzen, main and foremast. Skysails are sails carried above the topsails. The outer jib, inner jib and fore staysail are head sails. A spanker is the gaff-headed sail rigged on the after mast. The standing lug is used chiefly on fishing craft and ship's boats. The Gunter lug is used on yachts. The spritsail is used on fishing craft, boats, etc. The Thames barge has what is known as a spritsail ketch rig. The lowest square sail on any mast is the "course"; that on the mizzen is known as the "cross-jack" and that on the main mast as the mainsail. Except for pleasure purposes the usage of sails will soon become extinct, except for reserve and emergency power, for steam has superseded canvas.

ST. ALBANS. A Cathedral City and Municipal Borough of Hertfordshire with an area of 2698 acres and a population of 28,625 in 1931. It was once the capital of King Cassivelaunus, and later one of the chief trading centres and urban settlements of the

Romans, under whom it held the rank of municipium. Laid waste by the Saxons in the Middle Ages, it grew again as a religious centre and consequently a flourishing city deriving its wealth partly from the great number of pilgrims who came to the shrine of St. Alban, the first martyr of England. On the site of the present cathedral there was an early Saxon church, a Benedictine priory founded at the end of the eighth century. The nave of the present structure is Gothic, but the tower is pure Norman and shows traces of Roman tiles. The abbey gateway is a relic of the fourteenth century, and after the Dissolution was used as a gaol. It is now the approach to St. Albans' Grammar School. The clock tower, itself ancient and of great beauty, contains a curfew bell dated 1335. The Moot Hall in Market Place was the scene of the trial of the ringleaders in the Wat Tyler Rebellion. Several old inns survive, notably "Ye Old Fighting Cocks," said to be one of the oldest inhabited houses in England. Bleak House, in Catherine Lane, is a link with Dickens' work of the same name. Besides the cathedral and the abbey, two old churches deserve mention—St. Stephen's, part of which is of the tenth century, and St. Michael's, which is of similar date and, like



ST. ALBANS

1. The Cathedral, it shows the styles of many periods, the central tower and eastern bay are good examples of the more severe Norman work. 2. Ye Old Fighting Cocks, the most outstanding example in England of a round house. 3. Roman wall unearthed at Verulamium. 4. The Abbey Gateway

Photos Frith, Taylor

the cathedral, constructed partly with Roman tiles.

ST. ALBANS, BATTLES OF (1455 and 1461).
See **ROSES, WARS OF.**

ST. ANDREWS. The ancient Burgh of St. Andrews, on the east coast of Fifeshire, Scotland, had a population of 8269 at the 1931 census. It overlooks a bay of the North Sea, and is served by the L.N.E.R. The "Old Grey City by the Sea," as St. Andrews is called, is famous for its golf courses and attracts golfers from all parts of the world. It is also a well-known educational centre (its University dates from 1411) and holiday resort. Among the many interesting buildings are the following—

West Port, a gateway mentioned in chronicles as far back as 1560.

Blackfriars Monastery, founded in 1272. The present remains date from 1525.

Holy Trinity Church, in which John Knox many times preached in 1547.

Abbey Wall, an ancient wall with many towers.

The Cathedral, the scene of many events of historical interest, now one of the most interesting ruins of the city.

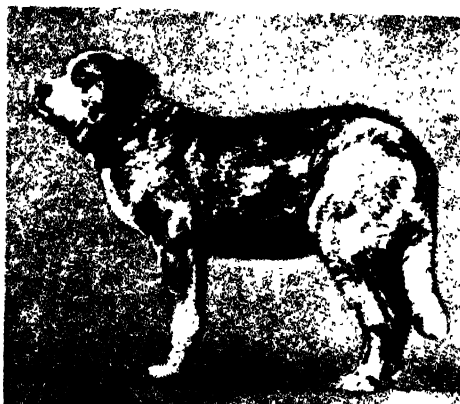
The Castle, built about 1200, also of great historic interest. It was alternately palace and prison for many years, and over a period of years its possession frequently changed hands after battles between the English and the Scots.

ST. BARTHOLOMEW'S DAY, MASSACRE OF. A massacre which began in Paris early in the morning on the feast day of St. Bartholomew, 24th August, 1572. It was the result of years of strife between the Roman Catholic and Huguenot (Protestant) parties in France. In 1570 a peace treaty had been made, according to which Prince Henry of Navarre, a Huguenot leader and sympathizer, was to marry Margaret, the daughter of Catharine de' Medici and the sister of King Charles IX. The wedding festivities took place in Paris about two years after the treaty, and a few days before St. Bartholomew's Day; among the powerful Huguenot leaders who came to the city to attend them was Admiral Coligny. The admiral roused the hatred and fear of the queen mother by attempting to draw her son away from her and by trying to persuade the king to make war against Spain. Accordingly, she tried to have Coligny assassinated.

When this plot failed, Catharine, together with the Guises, uncles of the king and staunch Catholics, persuaded Charles that Coligny was a dangerous enemy, and induced him to sign a decree ordering the massacre of the Huguenots. A fanatical mob joined the executioners in Paris on Sunday, 24th

August, and the massacre was taken up in the provinces. The number who perished is variously given, estimates ranging from 2000 to 100,000.

ST. BERNARD DOG. Many theories have been advanced regarding the origin of the St. Bernard, but no very satisfactory conclusion seems to have been reached. A very general view is that the monks of the St. Bernard Hospice worked first with a breed of dog close at hand and easily obtained—the Sennenhund. When they desired to increase the size and strength of their dogs, outside blood was introduced, probably that of the



ST. BERNARD DOG

This photograph is of "Barry," a dog which saved forty people and was slain by a traveller who mistook him for a wild animal.

Great Dane, Pyrenean Mountain Dog, and perhaps the Mastiff. The dogs were trained in rescue work in the snow of the high Alps, and many are the accounts of their wonderful work. Perhaps the most famous was "Barry" who saved 40 lives.

The general outline of these magnificent dogs suggests great power and endurance. A dog should be upwards of 30 in. in height at the shoulder—the taller the better—and weigh 170 to 210 lb. The frame must be massive and bone sound.

In the long-coated variety the coat should be dense and flat, rather fuller round the neck. The thighs should be feathered, but not too heavily. A curly coat is objectionable. In the smooth-coated variety, the coat should be dense, hard, flat and short, slightly feathered on thighs and tail. The colour should be red, orange, or various shades of brindle (the richer the colour the better) on white, with patches on the body of the above-mentioned colours.

ST. BERNARD, GREAT. A famous pass over the Alps, now noted chiefly for the hospice at its summit, about 8100 ft. above

the sea, maintained by the Augustinian Canons as a refuge for travellers.

ST. ELMO'S FIRE. The name given to an electrical phenomenon in the form of a circle of light, sometimes seen, especially in southern regions during thunderstorms, about the masts of ships, at the tops of spires and trees, on the manes of horses, and occasionally about human heads. Among the Greeks, the phenomenon was the basis of the myth of Castor and Pollux; its appearance was regarded by sailors as a friendly omen. The origin of the name is uncertain, but it is probably an Italian corruption of *St. Erasmus*, the name of a bishop whom Mediterranean sailors regard as their patron saint, and who was martyred in the year 304.

ST. ETIENNE, *saNt et yen'*. See FRANCE.

ST. GEORGE'S CHANNEL. An arm of the Atlantic Ocean which separates Wales from the south of Ireland. It is about 100 miles long, and its width varies from 60 to 100 miles. It runs from Holyhead and Dublin to St. David's Head.

ST. GERMAIN, TREATY OF. The Treaty of Versailles recognized Austria-Hungary as a single diplomatic unit but each was proclaimed a separate republic in November, 1918. The Treaty of St. Germain, signed 10th September, 1919, was between the twenty-five Allied and associated Powers and Austria, Rumania and Yugoslavia, however, did not sign until some months later. The Treaty reaffirmed large sections of the Treaty of Versailles but reduced the area of the new republic from 116,000 sq. miles to about 32,000 sq. miles and by so doing deprived it of any maritime port. Complete independence of Poland, Yugoslavia, Czechoslovakia and Hungary is a requirement, and union between Austria and Germany is forbidden. The Treaty was ratified by the Austrian National Assembly on 17th October, and became operative on 16th July, 1920.

ST. GOTTHARD. A Swiss plateau in the Central Alps. The entire area of the plateau, or mountain group, is 644 sq. miles, of which about four fifths is Swiss and one-fifth Italian. It is broken up by lofty peaks, and has a cross valley through which passes a famous Alpine road (see below). Monte Leone, the highest peak of the group, lying east of the Simplon Pass, is 11,694 ft. in height. North of it are the Waserhorn, nearly as high, and the Bortelhorn. Here the Rhine, the Rhône, and other rivers have their source.

A railway tunnel passes through the St. Gotthard Pass in the Alps, connecting the railways of Northern Italy with those of Switzerland and Germany. Constructional operations began in 1872, and the work was

completed in 1880. It is 9½ miles long, and reaches a height of 3786 ft. above sea level.

ST. HELENA, *hel e' na*. A British island in the Atlantic Ocean, 1200 miles west of the African coast and 700 miles south-east of Ascension Island, the nearest land. It has an area of forty-seven sq. miles. It was the enforced home of Napoleon Bonaparte from 1815 until his death, 5th May, 1821 (see NAPOLEON BONAPARTE). St. Helena was discovered in 1502 by the Portuguese, but it has belonged to Great Britain since 1651.

The island is a rugged, mountainous mass of volcanic origin. The only village and port is Jamestown, the capital. The population is of mixed Europeans, East Indians, and natives of Africa, and numbers 3995.

ST. HELENS. The County Borough of St. Helens is situated in the south-west of the county of Lancashire, about ten miles east of Liverpool and twenty miles west of Manchester. It had a population of 106,793 at the 1931 census. The town is served by both the L.M.S. and L.N.E. railways, and has good road and canal transport facilities. As a manufacturing centre, St. Helens has the advantage of close proximity to coalfields. Industries include the manufacture of glass and chemicals, in which the coal of Lancashire and the salt of Cheshire are of considerable assistance. St. Helens returns one member to Parliament.

ST. IVES. See CORNWALL; HUNTINGDONSHIRE.

ST. JOHN, HENRY. See BOLINGBROKE VISCOUNT.

ST. JOHN. The largest city and chief port of New Brunswick. It is the distributing centre for a large agricultural and lumber trade. There are important fisheries. Population (1931) 47,514. See DOMINIONS VOLUME, CANADA.

ST. JOHN'S. The capital of Newfoundland, situated on the eastern shore of the island. Population, 44,483 (1934).

Two hills, Signal and South Side, guard the entrance to the harbour, an opening 1400 ft. wide. The Narrows are nearly half a mile long.

As the centre of industry in Newfoundland, St. John's has manufacturing plant in connection with equipment for fishing vessels, rope, paints, varnishes, oilcloth, and soaps. Some raw material is imported from England and the United States, and manufactured into boots and shoes, tobacco products, furniture, and clothing. Excellent docks and warehouses are provided, and a large dry dock is available for repairs.

St. John's was founded by a group of Devonshire fishermen in 1580. The settlement was contested by the French and the English, and from 1697 until 1762 it was

held alternately by each country. By the Treaty of Utrecht (1713), Newfoundland was ceded to England, and St. John's became the capital of the "senior colony."

ST. JOHN'S WORT, *wurt*. A family of plants in all of which the flowers are yellow with five petals and have a large number of stamens. For the most part the plants are shrubby and the leaves are without a stalk. Often a viscous fluid is secreted by the leaves and stems. Cultivated varieties grow well on shady banks but are difficult to eradicate.

Scientific Name. The St. John's wort is of the family *Hypericaceae*; it is *Hypericum calycinum*.

ST. KITTS OR ST. CHRISTOPHER. One of the Leeward Islands of the West Indies with an area of 65 sq. miles and a population of about 37,000. Sugar cane, cotton and coconuts are grown. Salt is exported.

ST. LOUIS, MISSOURI. The chief city of the State, and seventh in the United States; it lies on the Mississippi River. St. Louis has become a great commercial and industrial centre by reason of its situation in the heart of the fertile agricultural region of the Mississippi Valley, and because of its network of railways. Population (1930) 821,960.

St. Louis stands sixth among the cities of the United States in value of manufactures, which include shoes, drugs, bricks, terra-cotta, macaroni, stoves, ranges, enamel ware, and electric tramcars. The city is the largest primary market for American raw furs, and ranks among the leading cities of the country in the manufacture of

tobacco. St. Louis is also a great grain and livestock market, and conducts an immense wholesale trade in bags, carpets, chemicals, trunks, sugar-mill machinery, open-hearth steel castings, timber, and timber products.

The St. Louis of to-day is the outcome of a fur-trading post established in 1764. In 1770 France ceded all of her territory west of the Mississippi River to Spain, and St. Louis became the capital of Upper Louisiana. In 1800 Spain retroceded Louisiana to France, which in turn transferred it in April, 1803, to the United States.

ST. LUCIA, *lu' shia*. One of the Windward Islands (which see)

ST. MORITZ, *morrits*. See SWITZERLAND

ST. PAUL AND AMSTERDAM ISLANDS. Two small, mountainous, uninhabited islands in the Indian Ocean in latitude 38° S. and longitude 77° E. Nominally they belong to France and are dependencies of Madagascar. Owing to the frequency of shipwrecks stores of provisions and shelter are available

ST. PETERSBURG. See LENINGRAD

ST. PIERRE AND MIQUELON, *sa'N pyair', me' k' lo'N*. Groups of small islands representing the only remaining French possessions in North America, and situated about 10 miles south-west of Newfoundland. The Miquelon group, consisting of Grand Miquelon and Little Miquelon (joined by a belt of sand), is 83 sq. miles in area, and has a population of about 500. Though small, St. Pierre, with 10 sq. miles, has a population of 3700. The islands, though barren and



ST. LOUIS, MISSOURI

rocky, are important as the centre of the French Atlantic fisheries. Cod is the principal catch, and tons of fish are exported annually.

The chief town, St. Pierre, has a good harbour. The colony is administered by a governor, assisted by a council of administration and municipal councils.

France originally occupied the islands in 1660. They were held alternately by England and France until 1814, when France obtained undisputed possession of them as a fishing station.

ST. QUENTIN, BATTLES OF. See **WORLD WAR.**

SAINTS. In its general reference, the term denotes persons remarkable for holiness and piety, but in the Christian Church it is applied in a more restricted sense. It is true that in New Testament times all members of the Church were designated as Saints, the Greek word used being connected with the idea of the separateness of the Christian from the heathen world about him.

Later, however, the name came to be applied only to certain specially venerated persons after their deaths. It was natural that such veneration should grow up round the names of the twelve Apostles, Saint Paul and Saint Barnabas, and the Evangelists.

Then, as persecutions came upon the Church, and martyrs suffered torment and death for their belief, honour was paid to them in the places where they had lived or where they had died, and they too were remembered as "Saints".

Such practices arose in a natural and spontaneous way locally, and became liable to abuse. For the prevention of scandals the bishop of the province was made responsible for the decision whether such honour should be given to any particular person or not, and out of this rule grew the practice of Canonization (which see), which regulated the whole system.

SAINT-SAËNS, *saN sahNs'*, [CHARLES] [CAMILLE (1835-1922)]. A typically French composer, born in Paris. His first symphony was written at the age of 16.

In 1863 the Society of St. Cecilia of Bordeaux awarded first honours to his overture *Spartacus*, and in 1867 the authorities of the International Exhibition at Paris awarded him the prize for his cantata *Noces*. These honours, together with fame as a pianist, came to him before his thirty-second birthday, but it was not until 1872 that Saint-Saëns had an opera accepted. Yet this first effort, *The Princess*, was not successful, and others that followed it met with little favour. In 1877, however, his Biblical opera, *Samson and Delilah*, produced at Weimar, was widely acclaimed. Saint-Saëns will

always be better known for his symphonic poems, such as *La Danse macabre* and *Phaëton*, and for his short, graceful compositions for the piano.

ST. SALVADOR, OR WATLING ISLAND. One of the Bahamas group in the West Indies; population, 675. Its importance lies in its having been the first land on which Columbus set foot in his voyage across the Atlantic in 1492.

SAINTSBURY, GEORGE (1845-1933) An English author and critic. He became professor of rhetoric and English literature at Edinburgh. Among the best of his works of criticism are *A History of English Prose*, *The English Novel*, *English Prose Rhythm*, and the studies on *Matthew Arnold* and *Sir Walter Scott*.

ST. SOPHIA'S. See **MEHMEDIE MOSQUE.**

ST. VINCENT. A mountainous island in the British West Indies, a part of the Windward Islands (which see). St Vincent has an area of 150 sq. miles, half of which is still covered with forests. The valleys are fertile.



STREET SCENE IN ST VINCENT
Photo George Long

although eruptions of the volcano Soufrière have twice devastated considerable portions of the island. The chief products are arrowroot, cocoa, cotton, fruits, and spices. The quality of the sea-island cotton is said to be the best in the world. The capital Kingstown, is a picturesque town with a population of about 3900; the total population of the island is 53,228 (1930), mostly negroes, descendants of freed slaves.

ST. VITUS' DANCE, OR CHOREA, *ko re'*
a. A nervous disease that most commonly attacks children between the ages of 5 and 15, especially girls. It is characterized by muscular jerking of the face, neck, arms, hands, and various other parts of the body. It may be brought on by overstudy, worry, lack of outdoor exercise, late hours, fright, and shock. The disorder is closely related

to rheumatic fever, being almost certainly caused by the same germ.

The germ gains entrance to the system usually by way of diseased tonsils or teeth, and affects the brain and spinal cord. While St. Vitus' dance in its ordinary form is seldom fatal, an attack may last from six weeks to six months, and the disease tends to recur if proper precautions are not taken.

The term *chorea* is derived from a Greek word meaning "dance"; the other and more common name has come into use through associating the disease with a form of hysteria which prevailed in Central Europe in the sixteenth century, cures for which were sought at the shrines of Saint Vitus.

SAKHALIN, *sa kah leen'*. A long, narrow island (600 miles long and 16 to 100 miles wide) off the south-eastern coast of Siberia. It was divided in ownership between Russia and Japan after the Russo-Japanese War. The part north of 50° is Russian; the southern, Japanese, portion is known specifically as *Karafuto*. The island covers 27,523 sq. miles. Japan's holding, south of 50°, covers 13,935 sq. miles, and has a population of 295,187 (1930). The highest point is 4860 ft. In the Russian territory, important oil discoveries have been made.

Fisheries provide the chief occupation and the staple food of the inhabitants.

SALAD. A preparation of raw herbs, vegetables or fruits, cut up and seasoned with salt, vinegar, or some other dressing. These may be combined with chopped meat or fish. From a dietetic standpoint the use of green salads is of value as many nutritive elements, lost in cooking, are conserved. The ingredients are varied and may include lettuce, celery, mustard-and-cress, beetroot, onion, tomato, and cucumber. Lettuce, endive, onion, leek, water-cress and cucumber were well known to the Greeks and Romans, but lettuce and cucumber salads only became popular in England in the sixteenth century. The radish, too, although used by the Egyptians, does not appear to have reached this country until about 1548, and about the same time the tomato was brought to Europe from America.

SALADIN, *sal' a din* (1138-1193). A sultan of Egypt and Syria, who rose from a soldier of the shepherd tribe of the Kurds. The name is a corruption of Salah-ed-din (Honour of the Faith).

He came to Egypt in the train of his uncle Shirkuh, who was sent by Nur-ed-din of Syria in 1169 to drive out Amalric, King of Jerusalem. The Fatimid Caliph el-Adid made Shirkuh his vizier and appointed Saladin two months later, when his uncle died. After Saladin had crushed a rising of negro

troops and repulsed a Christian invasion, he proclaimed the Abbasid Caliph in 1171.

In 1174 the death of Nur-ed-din left Saladin the foremost Moslem prince, and the accession in Jerusalem of a child, Baldwin the Leper, weakened the Christians. In two years Saladin had gained control from Egypt



RICHARD THE LION HEART FIGHTING
SALADIN'S SARACENS

Photo: Mansell

to the Euphrates, except for the Frankish kingdom.

For six further years he cared for Egypt, founding in Cairo the great collegiate mosque. He formed an alliance among the neighbouring Moslem powers and in 1182 began the campaigns which gave him Mesopotamia. In 1187 he was able to undertake the *jihad* or Holy War against the infidels. Baldwin the Leper had been succeeded by Guy of Lusignan. Him Saladin crushed at Hittin, so that Jerusalem and all Palestine were overrun. Tyre only held out as a base for the Crusaders, who besieged Acre. In 1191 Richard of England and Philip of France brought up the hosts of the Third Crusade. Acre was taken but not Jerusalem, and in 1193 terms of truce allowed to the Christians the coastal towns and right of pilgrimage to the Holy City.

Saladin, whose health had been worn out, died shortly after the signing of the treaty.

SALAMANDER. Small animals with lizard-like bodies, four sprawling legs, and long tails. They belong to the same class as the frog, toad, and newt, being closely



SALAMANDER

Photo: G. R. Gook

related to the latter (see NEWT, AMPHIBIA). In a scientific sense, *salamander* is the name of a genus of amphibians found

only in the Old World. Newts, too, are sometimes placed in this group.

The *spotted salamander* of Europe, Asia, and Africa is one of the best-known species. It is from 6 in. to 8 in. long, and has conspicuous black and yellow markings on its smooth, shiny skin. When roughly handled, its pores exude a milky, poisonous secretion which is a protection against its enemies. The eggs, which are laid in ponds or springs, hatch into creatures which breathe by external gills, and which, though they have four limbs, live a fishlike existence during the larval period. When full grown, the salamander becomes a land animal, frequents damp places, and feeds on snails, slugs, worms, and insects. The *giant salamander* of China and Japan lives entirely in the water and has both lungs and gills in the adult stage.

Scientific Name. Salamanders belong to the family *Salamandridae*. The spotted salamander is *Salamandra maculosa*.

SALAMIS. An island belonging to Greece, situated in the Gulf of Aegina (Saronic Gulf), due west of Athens. Barren, rocky, and mountainous, with an area of 36 sq. miles, the island supports a population of about 6600, chiefly Albanians. Grain, olives, and grapes are raised in the valleys and coast regions. The modern name of the island is



FORUM OF SALAMIS (CYPRUS)

Photo: George Long

Kuluri. At Ambelaki, a city on the north-eastern coast of the island near the site of the ancient capital, there is a naval arsenal.

In Homer's writings, Salamis belonged to Telamon and his sons Ajax and Teucer. The narrow strait between the north-eastern corner of the island and the coast of Attica was the scene of the decisive naval battle of Salamis, fought in 480 B.C. between the

Greeks and Persians, a few days after the battle of Thermopylae. The Persians were completely routed, losing 200 ships.

Salamis was also the name of an ancient



CELEBRATING THE VICTORY AT SALAMIS

seaport on the east coast of Cyprus, founded by the Achaeans and of some importance under the Roman Empire.

SAL-AMMONIAC. A white volatile compound of chlorine and ammonia, the chemical name being *ammonium chloride*. It is prepared in large quantities, by distilling the residual liquid after the extraction of coal gas. In its crude form, sal-ammoniac is a dirty-white solid, but when purified it forms fibrous white crystals. Crude sal-ammoniac is employed extensively in the manufacture of electric batteries of the Leclanche type, for cleaning surfaces to be soldered, in the manufacture of galvanized iron, in gold refining, and in the textile industries. In a pure state, it is used as a remedy for bronchitis, pneumonia, and some stomach disorders. It dissolves readily in water, to which it imparts a salty taste.

Chemical Formula. The formula for sal ammoniac is NH_4Cl , i.e. a molecule contains one atom of nitrogen, four of hydrogen, and one of chlorine. The radical, NH_4 , acts in compounds like a metal.

SALAZAR, ANTONIO DE OLIVEIRA (born 1889). Prime Minister of Portugal since 1932. Dr. Salazar first gained recognition by his brilliant lectures after his appointment as Professor of Economics and Science at Coimbra University in 1916. During the succeeding years he did not hesitate to criticize the financial policy of the Government, which proved unequal to the task of rescuing the country from the post-war depression.

In 1926 Dr. Salazar was appointed Minister of Finance and set about his task with such efficiency that Portugal was able to balance its budget for the first time for many years, and it has since continued to do so. His reorganization was not carried out without opposition and he resigned in protest, but

his services were too valuable to lose and he was asked to resume the position which he continued to hold until 1928.

In 1930 he was appointed Minister for the Colonies, and fully determined to make a success of his work, he made an extended tour through them. For many years the colonies had received scant attention; they were neither sufficiently exploited nor well administered, and the outcome of Dr. Salazar's tour was the new Colonial Act, which has effected widespread improvements.

In 1932 Dr. Salazar became Prime Minister and Minister of Finance, and in 1933 he submitted to a plebiscite a new constitution based on the system of the Corporate State. The plebiscite was in favour, and the new constitution was inaugurated with the meeting of the National Assembly in 1934.

SALE OF GOODS. The branch of law dealing with the sale of goods covers transactions ranging from the sale of a packet of pins at a haberdasher's to the consignment of a shipload of valuable merchandise. For the most part the same principles of law apply whatever the scale of the transaction, except when an action is brought in Court in which the plaintiff asserts and the defendant denies that goods were contracted to be sold. If the value of the goods is less than £10 the plaintiff can prove that a contract of sale was entered into by any evidence that happens to be available, but if the goods are worth £10 or more, he cannot succeed in his action unless he can either produce as evidence some written document signed by the defendant or by the defendant's agent, or prove that the purchaser accepted and actually received part of the goods or paid part of the purchase-money or gave something "in earnest" to bind the bargain. Most of the disputes over sales of goods, however, arise on the question whether the goods delivered are in accordance with the terms of the contract. In the absence of any special agreement to the contrary, the rule of law is that where anyone supplies goods in the ordinary course of his business, and the buyer makes known to him the purpose for which the goods are required, the seller is bound to supply goods reasonably fit for that purpose, if he fails to do so, he will be liable in damages to the buyer. But this rule does not apply where the buyer orders some specified article under its trade name, because in that case he is relying on the name and not on the judgment of the seller. If the buyer has himself examined the goods, the seller is not liable for defects which the buyer ought to have detected. Where goods are sold by sample, the rules are rather more complex, the main

rule is that the seller must see that the bulk corresponds with the sample. In selling goods, the seller impliedly represents that the goods belong to him, or at any rate that he has a good right to sell them. If this turns out not to be the case, the sale is ineffective to pass the property in the goods to the buyer, and he may be compelled to hand them over to their true owner. Goods bought "*in market overt*," i.e. in any legally constituted market, however, become the property of the buyer whether the seller had any right to them or not. Any shop in the City of London where goods are publicly exposed for sale is a *market overt*.

SALESMANSHIP. Unlike the production side of a business, the selling side cannot be organized to function in a mechanical or automatic way. In selling, the personal equation is always uppermost, and dogmatism as to the facts of salesmanship is impossible. Experience, however, is gradually being reduced to principles, and selling methods common to groups of commodities are being discovered. The psychological factors involved in selling have also, within recent years, been seriously studied.

The value of the study of the details of salesmanship is self-evident in those transactions which concern the casual buyer, as in a department store. A better example is, perhaps, the case of selling products at the buyer's home, especially those products which need to have their utilities demonstrated; highly-skilled salesmen are employed and they concentrate their energies on limited districts and upon a particular class of person. It is clear that salesmanship can be learnt, the salesman can make himself progressively more efficient, behind the successful sale must be a well-thought-out sales policy, and behind the skilled salesman must be developed strength of character, commodity knowledge, stock knowledge (the knowledge of all articles stocked in his own department of the firm, and some knowledge of the other commodities handled by other departments, and human nature knowledge are among the more important parts of a salesman's equipment. But there should be a groundwork of sound general education. The salesman should have a grasp of the fundamental principles of commerce, business methods and organization, and have been given appropriate instruction and training in respect of his trade, his commodity, his markets, and the best methods of selling that commodity in those markets.

SALFORD. The city of Salford adjoins Manchester in that great industrial and commercial area South-east Lancashire, and

has a population of 223,438 (1931). The chief docks of the Manchester Ship Canal are within its municipal boundaries, and it has no fewer than eight railway stations (L.M.S.R.). The River Irwell runs between Manchester and Salford, twelve bridges connecting the two towns. There are evidences of Roman occupation, though ancient buildings are very few. Salford docks berth steamers from all parts of the world. The industries of the town are many and varied. There are some cotton spinning and weaving; bleaching, dyeing and calico printing; engineering; chemical, paper, rubber, glass, as well as timber, brewing, and other industries. The imports handled at the docks include grain, cotton, timber, cattle, foodstuffs and provisions, fruit, tea, wool, oil, etc., while manufactured cotton and woollen goods, machinery, iron and steel, chemicals, hardware, pitch, coal, salt, paper-making materials, and other goods are exported.

SALFORD HUNDRED COURT. A Court formed in 1868 by the amalgamation of two ancient Courts, the Court of the Hundred of Salford and the Manchester Court of Record. It deals principally in actions where comparatively small sums are at stake, but which require a jury.

SALIC, *say' lik*, **LAW.** A compilation of the barbarian laws of the Salian, or Merovingian, Franks. Its date is uncertain, but there is evidence that it was compiled in the reign of Clovis (466-511). Essentially, it is a penal code prescribing fines and compensations for various offences and adding the rules of procedure by which these could be enforced. It contains little private law in the ordinary sense, but there is one famous clause, which by itself is often called "the Salic Law," viz "Of Salic land, no portion of the inheritance shall come to a woman." This was later applied to inheritance of the throne, which had not been mentioned in the original code; the first application in this connection appears to have been at the death of Louis X in 1315. In 1328 the claim of Edward III of England to the French throne was excluded on the ground that it was derived from his mother, Isabella, daughter of Philip IV of France. In 1714 Philip V introduced the Salic Law into Spain, but it was revoked by Philip VII in 1830. It was this law, too, that prevented Queen Victoria from succeeding to the throne of Hanover at the death of William IV.

SALICYLIC, *sal i sil' ik*, **ACID.** A compound of carbon, hydrogen, and oxygen, occurring in combination in the oils of wintergreen and birch, and in some chemical substances. It has many uses, and is manufactured for commercial purposes from oil

of wintergreen, or from carbolic acid. When pure, it occurs in fine, white, needle-like crystals. It has a sweetish acid taste, is sparingly soluble in cold water, but dissolves readily in hot water.

Salicylic acid is extensively used in medicine. It is an ingredient of aspirin; with zinc oxide, starch, and petrolatum, it forms a paste used to cure ringworm and eczema, it is found in cures for corns and warts, and is taken internally for sore throat and rheumatic ailments. It is also effective as a remedy for excessive sweating. Salicylic acid is a powerful antiseptic.

The acid is employed industrially for strengthening glue, preserving hides, and, in combination with other substances, in the manufacture of yellow, orange, and purple dyes.

Chemical Formula. The formula for salicylic acid is $C_6H_4(OH)COOH$; that is, a molecule consists of six atoms of carbon, four of hydrogen, and the two radicals, OH and COOH. These are associated atoms of oxygen and hydrogen, and of carbon, oxygen and hydrogen, which remain together in chemical reactions.

SALII, *say' le e*. Name of two colleges of priests in ancient Rome. Their origin is linked up with the origin of the City, for they were priests of Mars, the chief deity of the native Italians by whom Rome was founded, and of Quirinus, a deity associated with the Sabine race. The two colleges were associated respectively with the temples on the Quirinal Hill and the Palatine Hill. The latter settlement was probably of purely Latin origin, whereas that of the Quirinal may have been of Sabine origin.

SALISBURY, ROBERT ARTHUR TAUBAL GASCOYNE-CECIL, THIRD MARQUESS OF (1830-1903). Prime Minister of England. Born at Hatfield in Hertfordshire, he was educated at Eton and Christ Church, Oxford. In 1853, as Lord Robert Cecil, he was elected member of Parliament for Stamford. His early reputation was won in journalism by pungent articles in the *Quarterly Review* and other periodicals opposing democratic reforms. As early as 1865,

he began to be looked upon as one of the foremost politicians of England. In the latter year, he became Lord Cranborne, by the death of his brother. A year later, he entered the Cabinet as Secretary of State for India,



LORD SALISBURY
Photo: Brown Bros.

but resigned on the introduction of Disraeli's Reform Bill conceding household suffrage. In 1868, on the death of his father, he succeeded to the title, and took his place in the House of Lords.

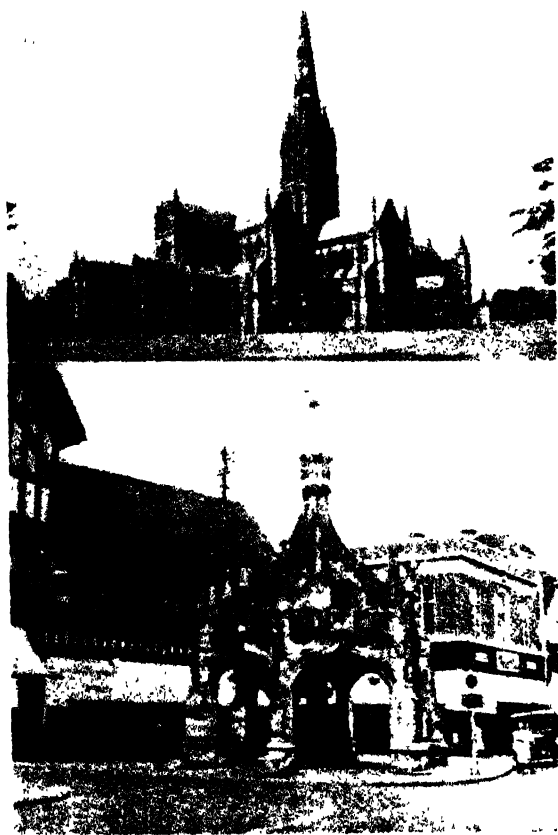
Between 1869 and 1873, Salisbury was leader of the Opposition, but in 1874 he took office as Secretary of State for India in the newly organized Cabinet of Disraeli. In 1878 he became Secretary of State for Foreign Affairs, and it was largely his influence which brought about the Congress of Berlin, which he attended with his chief, Disraeli.

The Conservatives went out of office in 1880, and in 1881, on the death of Beaconsfield, Salisbury became leader of the Conservative party. Not until 1885 was he again in office, but this time it was as Premier. Before anything had been accomplished, the Conservatives were defeated in a general election, and Gladstone became Prime Minister, though with a majority dependent on the Irish vote. His introduction of the Home Rule Bill in 1886 split the Liberal Party, and the defection of the Unionist section led to the fall of the Gladstone ministry and the return of Salisbury, who, save for the years between 1892 and 1895, remained at the head of the government until 1902.

One of the chief events of his administration was the agreement with Germany in 1890, by which the British and German spheres of influence in Africa were marked out. In 1895 a break with the United States on the Venezuelan question threatened, but Salisbury managed to maintain peace in the face of difficulties. He was a strong imperialist and rejected the offer of foreign mediation on the outbreak of the Boer War in 1900.

SALISBURY. A cathedral city and Municipal Borough of Wiltshire with an area of 2845 acres and a population of 26,456 in 1931. Sarum, the ancient town, came into being before the Roman conquest. A Roman fort and Saxon stronghold (Sorbiodunum and Scaroabyrig respectively), it was fortified also by the Normans. The site of the city was moved in the early thirteenth century from the downs to the valley of the Avon, and the new city was granted its Charter by Henry III. As the capital town of Wiltshire it has increased in prosperity and is now

the principal market town for hundreds of square miles of the surrounding country. The first church of the See of Salisbury was completed at the end of the eleventh century at Old Sarum. The present cathedral was commenced in 1220, the Lady Chapel being the principal part of the original fabric



SALISBURY

(Above) the Cathedral; begun in 1220 and practically finished 50 years later, it is almost wholly in the Early English style
(Below) the Poultry Cross, erected in the fourteenth century

Photos Salisbury Corporation

which survives, whilst the cloisters and Chapter House are a little later. The famous tapering spire was added about 1330. Other features of interest in the town include the Poultry Cross, known to have existed in the early part of the fourteenth century, the Guildhall of the eighteenth century, and a number of Georgian and Elizabethan houses. The hall of John Halle in the street called The Canal is partly of fifteenth-

century design and includes a magnificent banquet hall, recently converted into the entrance to a cinema. Joiner's Hall is of the sixteenth century and has been taken over by the National Trust.

SALITE, *say' līe*. A dark-green variety of the mineral pyroxene (which see).

SALIVA, *sā lī' va*. A watery, mucoid, alkaline fluid secreted by three pairs of glands in the mouth and cheeks, known as the *salivary glands*. These are the *parotid*, in front of the ear; the *sub-maxillary*, under the lower jaw; and the *sub-lingual*, below the tongue. Other small glands in the mucous membrane of the mouth contribute to the saliva. Saliva contains a ferment known as *ptyalin*, which begins the digestion of starch and other carbohydrates, in the mouth. Saliva serves also to keep the mouth moist, a very important factor in our physical comfort. *Ptyalism*, or excess secretion of saliva, is a symptom of mercurial poisoning.

SALLUST, *sal' ust* (86-34 B.C.). A Roman historian of plebeian origin. He served as quaestor about 59 B.C., and in 52 as tribune of the people. When the Civil War broke out, he took the side of Caesar, whom he accompanied on his African campaign in the year 46 B.C. At its close, Sallust was appointed governor of Numidia, and while in this office, he was guilty of some extortion. Returning to Rome with a great fortune, he withdrew from public life and devoted his time to writing. Of his *Historiarum Libri Quinque*, there remain only fragments, but his accounts of the conspiracy of Catiline and the war against Jugurtha are extant. Neither of these is an impartial narrative: the *Catilina* was written to clear Caesar of complicity in the plot, the *Jugurtha* to extol Marius against the politicians at Rome.

SALMON. The salmon is a marine fish of temperate and arctic seas which migrates to

highest in the world's markets. Vast hordes of certain species of salmon, mainly of the Pacific types, of which there are five, invade



NETTING SALMON ON THE RIVER DEE

Salmon nets are paid out from a boat until a circle is formed, and the ends are then drawn together. Only eighteen licences are issued annually for this form of fishing on the Dee and licence holders make their casts in rotation

Photo Fox

the rivers of the North American continent each year, and an immense salmon canning industry takes toll of them. In the British Isles and on the northern portion of the European continent, the Atlantic salmon contributes toward the prosperity of a fishing industry only slightly less important. Here the bulk of the catch is sold fresh or smoked. Apart from its commercial value, the salmon is renowned for its sporting qualities, is responsible for a great deal of employment among country people in Scotland, Ireland, Wales, and in Scandinavia, and provides substantial incomes for the owners of rivers it frequents. Salmon live, usually, two years in the river and then migrate to sea, where they feed richly and put on weight to return one or two years afterwards as fish of from ten to twenty pounds. Their sea-feeding grounds are unknown, but they return unerringly from their wanderings in the ocean to their native rivers at maturity. Its graceful shape and beautiful blue-silver coloration



SALMON LEAPING UP CATARACT

Photo. Wide World

fresh water to reproduce its kind. It is one of the most highly developed of fishes, and has a sale and food value ranking among the

make the salmon one of the best known of fishes.

Scientific Name. The Atlantic salmon is *Salmo salar*.

SALMON TROUT. A species of trout which usually lives in salt water but ascends rivers at spawning time. See TROUT.

SALOME, sā lo' me. See JOHN THE BAPTIST.

SALONIKA, officially THESSALONIKE. See GREECE.

SALONIKA CAMPAIGN. See MACEDONIA; WORLD WAR.

SALT. As a seasoner and preserver of food, salt has been used from earliest times.

Chemically, salt is *chloride of sodium*, represented by the symbol NaCl. In mineralogy it is known as *halite* or rock salt. In chemistry, a salt is formed by the action of an acid on a metal, with liberation of hydrogen, or by the union of an acid and a base with liberation of water. Common salt is found in Nature in the oceans and salt lakes, in salt mines, and in brine springs.

Sea Salt. At one time, almost all of the common salt of commerce was produced by the evaporation of sea water, and considerable quantities are still obtained in this way.

known as the saturation method. The brine is then pumped to the surface and evaporated in the open air, or by artificial heat. The solid residue is then purified for marketing.

In England, salt is obtained at Northwich and other localities in Cheshire by mining



SALT AS CURRENCY

In many parts of Africa salt is an acceptable medium of exchange. Here is a "bank" showing the "cash" stacked in reed baskets 24 in. by 3 in. Each represents a unit equal to two-and-sixpence

Photo: OROC

rock salt or by tapping the brine springs in the beds and also by the saturation method. In Canada the salt industry is important chiefly in Ontario, which produces annually 270,000 tons. India also has a large output from the deposits in the Punjab, and great quantities are produced in the United States.

The richest fields in Europe are the Carpathian mines in Austria, where the vaulted chambers and pillars of salt extent 30 miles. Some of the largest salt mines in the world are at Wieliczka, near Cracow. There are large deposits also in Western Germany and other parts of Europe.

Uses. There are various grades of salt, known as table, common, fine etc. Salt is used as a seasoner of food, and as a preservative for meat and fish, also in the manufacture of soda and sodium compounds, soap, pottery, and glass. It is a good fertilizer and is a necessary part of the food of cattle. In addition, salt is valuable

as an emetic, gargle, and in baths. See SALTS.

Historical. When cereal and vegetable foods began to be used, salt became a necessity. It was used by the Hebrews and other Semitic peoples, and by the Greeks and Romans in their religious offerings



ROCK SALT STORE

Other Sources. Most of the salt of commerce is obtained by digging rock salt out of underground beds, that is, by mining it; by evaporating the water of natural brine springs; and by evaporating artificial brine. By the latter method, water is forced into salt beds and the salt is dissolved, this is

Among the Orientals of the present day, as in the past, salt used at a meal is representative of friendship and hospitality. In feudal days, when master and servants dined together in one hall, the servants sat below the salt.

SALT LAKE CITY. The capital and largest city of Utah, U.S.A. About 40 per cent of the residents are of the Mormon faith, and the city is known as the headquarters of that religious sect. Population (1930) 140,267.

SALTPETRE, OR NITRE. A compound of potassium and nitric acid, which bears a close resemblance to common salt in its outward appearance. In chemistry it is known as *potassium nitrate* (see POTASSIUM). Saltpetre is formed in soil by oxidation of decomposing organisms, and is found in considerable amounts in certain localities in Spain, Egypt, and India. For the most part it is made by treating sodium nitrate (Chile saltpetre) with potassium chloride.

Saltpetre crystallizes in six-sided prisms. It dissolves readily in water, to which it imparts a salty taste. It is a mild antiseptic, and small quantities are sometimes put into brine employed in preserving meat. Its most extensive use in industry is in the manufacture of gunpowder (which see). It is also employed in the manufacture of fireworks and matches. It is valuable as a flux in smelting certain ores, and is employed to some extent in dyeing.

Chile Saltpetre is a nitrate of sodium which obtains its name from the fact that extensive beds of it are found in Northern Chile. It is also called *soda saltpetre*. It is extensively employed in the manufacture of nitric acid and saltpetre, and as a nitrogenous fertilizer.

Chemical Formula. The formula for saltpetre is KNO_3 , that is, a molecule contains one atom of potassium (*kaliu*m in Latin), one of nitrogen, and three of oxygen. Chile saltpetre is NaNO_3 , the *Na*, in this latter formula, standing for one atom of sodium (*natru*um).

SALTS. A name given to saline laxatives generally. The more important are *Epsom salt*, or magnesium sulphate, *Glauber's salt*, or sodium sulphate, and *Rochelle salt*, or sodium and potassium tartrate. They produce copious bowel movements, and have the common property of drawing off water from the blood. In cases of emergency, and in the treatment of certain diseases, these salts are prescribed by physicians, but the indiscriminate use of any saline laxative is not to be advised. See PHARMACOLOGY.

SALUKI. Not only did Salukis exist about 5000 B.C., but there is evidence that even in those days they were used, as they are at the present day, to hunt the gazelle.

They are often referred to as "the gazelle hound."

With lines akin to our own more familiar greyhound, the Saluki has a manoeuvrability which admirably assists when chasing the gazelle at speeds approaching 40 miles an hour.

The utmost care is taken in the breeding of these dogs, some having pedigrees going back over a thousand years. A Bedouin sheikh will rarely part with one of his



SALUKI
Photo. Fall

Salukis, except it be given as a mark of esteem, for it is regarded as a really honoured member of the family.

Although desert dogs, accustomed to great heat, they stand the English climate very well. Contrary to the opinion of many unfamiliar with the breed, they are by no means delicate, in spite of their elegant appearance, are very intelligent, and affectionate, and make good guards.

SALVADOR. Officially EL SALVADOR, this Central American republic received its name from the Spanish adventurer Pedro de Alvarado, who conquered it in 1524. Its area is 13,176 sq. miles.

Of the population of 1,459,578 (1930) the majority are *mestizos* or *ladinos* of mixed Spanish and Indian blood.

Education is nominally free and compulsory, but only about one-fourth of the children of school age are receiving instruction. Educational facilities in the cities and larger towns are fairly adequate, but in the rural districts are poor. There is the National University at San Salvador. The language of the country is Spanish, and the dominant religion is Roman Catholic.

SAN SALVADOR, the capital city, was destroyed in June, 1917, by an earthquake

and volcanic eruption. It had also been destroyed in 1854 and in 1873. Each time the people rebuilt their city.

It has a number of manufactures, and carries on a thriving trade in coffee, tobacco, rubber, sugar, and other agricultural products. The city is one of the most attractive in Central America, with picturesque adobe houses, in a setting of luxuriant fruit trees and palms. Population, 98,555 (1932).

Climate, Land, and Resources.

Along the coast there is a low plain about 15 miles wide, known as the *hot lands*. The vegetation there is richly tropical, and the many forests abound in valuable timbers.

The interior of the country is a rugged plateau about 2000 ft. above sea level, broken by volcanic cones, some reaching heights of from 6000 to 8000 ft. On the tablelands and mountain slopes the climate is temperate and healthy. From May to October is the wet season, and from November to April is the dry season. The rainfall is abundant, and most of the land is under cultivation, though primitive methods are still largely employed. The principal crop is coffee, grown on the slopes of the mountains. Maize and sugar are also produced in quantities. Other crops are cacao, rubber, tobacco, and rice, and in the lower regions there are numerous large cattle ranches. Cotton-growing is encouraged by the government through the granting of bounties on exports.

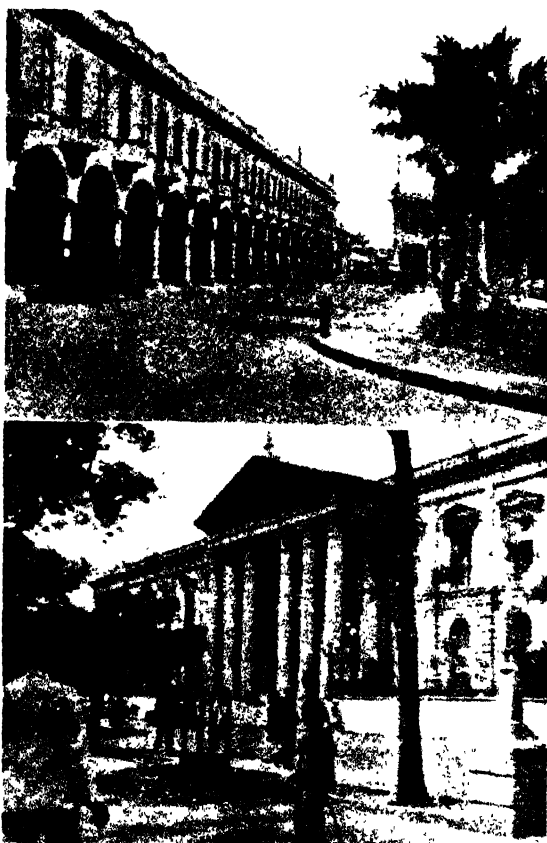
Gold, silver, copper, iron, and quicksilver are found, and mining is increasing in importance. Industrial establishments include sugar refineries, distilleries, starch factories, cordage works, cigar and cigarette factories, and plants for making fine cabinet furniture.

Transport and Commerce. Good roads and railways connect the chief ports, Acajutla, La Libertad, and Cutuco, with the chief cities, Santa Ana, San Salvador, and San Miguel. There are 330 miles of railway, all narrow gauge. Trade is chiefly with the United States, Britain, and France.

The opening of the Panama Canal proved a considerable boon to the country's commerce. The chief exports are coffee, sugar, tobacco, indigo, henequen, lumber, rice, balsam, and hides.

Government and History. Under a Constitution adopted in 1886, executive power is vested in a President, elected by direct

popular vote for four years. Legislative power is in the hands of a Congress of 42 Deputies, elected for one year by universal suffrage. After 1524 the country was a possession of Spain until 1821, when it revolted and joined the Mexican Confederation. Two years later it withdrew from



SAN SALVADOR

Top: City Square with Arcade Building (the left)
Below: The Government Palace

Photo: U. S. C.

that union, and later formed part of the Republic of Central America.

In 1830 it became independent. In recent years, Salvador has become one of the most orderly and best governed of the Central American republics. The republic became a member of the League of Nations in 1924. Early in 1921, Salvador, Honduras, and Guatemala formed a Central American Union but this was dissolved in 1922.

SALVAGE. The saving of property from danger. More particularly, in maritime law, the rendering of certain services to a ship

in distress. These services may consist of towing, piloting, navigating, or standing by the ship, landing or trans-shipping the cargo, crew or passengers, floating a stranded ship, raising a sunken ship or cargo, supplying stores or recruits to the crew, putting out a fire or removing property from a burning ship, delivering a ship from pirates, and so on. The essence of salvage is that the ship, its cargo, crew or passengers were in danger. A ship which renders salvage services to another is entitled to a reward, for which it can sue in a Court exercising Admiralty jurisdiction. *Prize salvage* is a reward payable in time of war, where a ship or its cargo is captured by the enemy and is then recaptured by a warship. Prize salvage is usually fixed at one-eighth of the value of the property recaptured.

SALVAR'SAN. A name given to a somewhat complex organic compound of arsenic, also called "606." Its chemical name is *dihydrochloride of dioxy-diamido-arsenobenzene*. It is used for one purpose only, viz. for the treatment of syphilis, and was first prepared by the German chemist Ehrlich in 1910; he has since introduced a modification of the drug, known as *neo-salvarsan*, or "914."

These substances are best administered by injection of a solution into a vein, an operation which requires some skill and experience. If treatment is begun in the earlier stages of an attack of syphilis, and continued for eighteen months or two years, salvarsan will effect a complete cure in a large majority of cases, and marked improvement takes place from the very first day.

Arsenic in any form is a highly poisonous substance, and even in the case of salvarsan, in which its poisonous character is reduced as low as possible, fatalities occasionally occur, mainly by damage to the small blood vessels of the brain or kidneys.

SALVATION ARMY. The title of a remarkable religious body whose activities are largely devoted to the furtherance of humanitarian ideals both by practice and exhortation. Its organization is world-wide, and it has a large membership which includes about 115,000 local officers apart from salaried officers, cadets and employees. It was founded by William Booth, born in Nottingham, 10th April, 1829, of poor parentage. In early years he knew intimately the conditions of those he afterwards described as the "submerged tenth," and decided to devote himself to their betterment. On Sunday, 2nd July, 1865, Mr. Booth conducted his first East End of London service in a large tent in a Quaker burial-ground at Mile-end Waste, White-chapel. He held that service under the title

of the East London Mission, but the title Christian Mission was used when the movement spread to other towns. This latter name was changed in 1878 to Salvation Army, when an organization formed somewhat on military lines was set up. The founder was himself styled "General," and all members were "soldiers," with "officers" bearing military titles. The writer, W. T. Stead, described the movement as "a new eruption of the old spirit (Quakerism) which has created the Salvation Army under the eyes of an incredulous and cynical generation." The Salvation Army, at first derided and persecuted, won the respect and admiration of all classes at home and abroad. When, in 1890, he put out a "Darkest England" scheme, General Booth asked the public to give him £1,000,000 to start it, and the money was immediately subscribed. King Edward VII and Queen Alexandra praised him for his labours and the gratifying result. The freedom of the City of London was presented to him. William



WILLIAM BOOTH

Booth was succeeded by his son Bramwell Booth, who was himself succeeded by Edward J. Higgins. In 1934 Evangelina Cory Booth, daughter of the founder, was elected General (see below). In 1929, on the appointment of General Higgins, there was some difference of opinion among members as to procedure, but an Act of Parliament in 1931 provided that in future the General should be elected by the High Council.

William Booth (1829-1912), founder of the Salvation Army, was born at Nottingham. He adopted the faith of the Wesleyans when fifteen, but later joined the Methodists and was ordained a minister. He left that body in 1861 in order to carry on the preaching of the Gospel in a way he had made peculiarly his own. In 1864 he began his evangelistic work in London.

Bramwell Booth (1856-1929), son and successor of General William Booth, nominated by him. During his Generalship, a movement arose among American Salvationists demanding "leadership by election," and, when dying, he was compulsorily retired in favour of General Higgins. See HIGGINS

Evangelina Booth. Fourth daughter of

William Booth. For five years she was in charge of the evangelistic work of the Army

in London, and was then appointed to the command of the Canadian Territory. When the Klondike gold rush occurred in 1898 she organized Salvation Army work in that region. In 1904 she was appointed Head of the Organization in the United States of America where she laboured with conspicuous success for thirty years. Upon the retirement of General



EVANGELINE BOOTH
Photo P & A

Higgins in 1934, she was elected by the High Council to succeed him and became General on the 14th November, 1934.

SALZBURG, *sahlts' boorg*. A town and province of the Austro-Hungarian Monarchy before 1918, and of the present Austria. See AUSTRIA.

SAMARIA, *sá mair' iá*. See PALESTINE.

SAMARITANS, *sá mar' rit anz*. Originally, Babylonian and Assyrian colonists brought by the king of Assyria to take the place of the deported Jews, after the fall of the northern kingdom (II Kings xvii. 24). Though heathens when they came, they adopted a large part of the Jewish religion, but also retained many heathen practices. The Jews regarded them as heretics. They became numerous enough to demand a share in the rebuilding of the Temple after the Jews returned from exile, but the latter scorned the proposal. Later, the Samaritans built a temple of their own on Mount Gerizim. This was destroyed by John Hyrcanus (about 120 B.C.). On the overthrow of Palestine by the Romans, however, the Samaritans shared the fate of the Jews, and 11,000 were slain by Vespasian on Mount Gerizim. Their ruin was completed by Justinian. A very small colony of them still persists, not more than 150 in number, in Nablus, near the ancient Samaria.

SAMARIUM, *sá mair' ium*. See CHEMISTRY.

SAMARKAND, *sam ar kani'*. See UZBEK.

SAMNITES. An ancient Italian people of Sabine origin, who lived in the mountainous region of Central Italy. They were divided into four nations: the Caraceni, in the north; the Pentri, in the centre; the Caudini, in the south-west; and the Hirpini, in the south. After four conflicts with the Romans, the Samnites were almost exterminated. See ROME.

SAMO'A, OR SAMOAN, OR NAVIGATOR ISLANDS. An archipelago of fourteen islands in the South Pacific Ocean in about lat. 15° S., 4200 miles south-west of San Francisco, and over 2400 miles north-east of Sydney, Australia. These islands are nearly all of volcanic formation, and are enclosed by coral reefs. They have a combined area of about 1100 sq. miles. At the outbreak of the World War in 1914, the Samoan archipelago was owned partly by Germany and partly by the United States, the dividing line being the 171st parallel of W. longitude. On 29th August, 1914, a New Zealand force occupied Apia, and in 1920 German Samoa was brought under the administration of New Zealand, by mandate



SAMARIA SEEN THROUGH PALESTINIAN ARCHWAY
Photo U. & U.

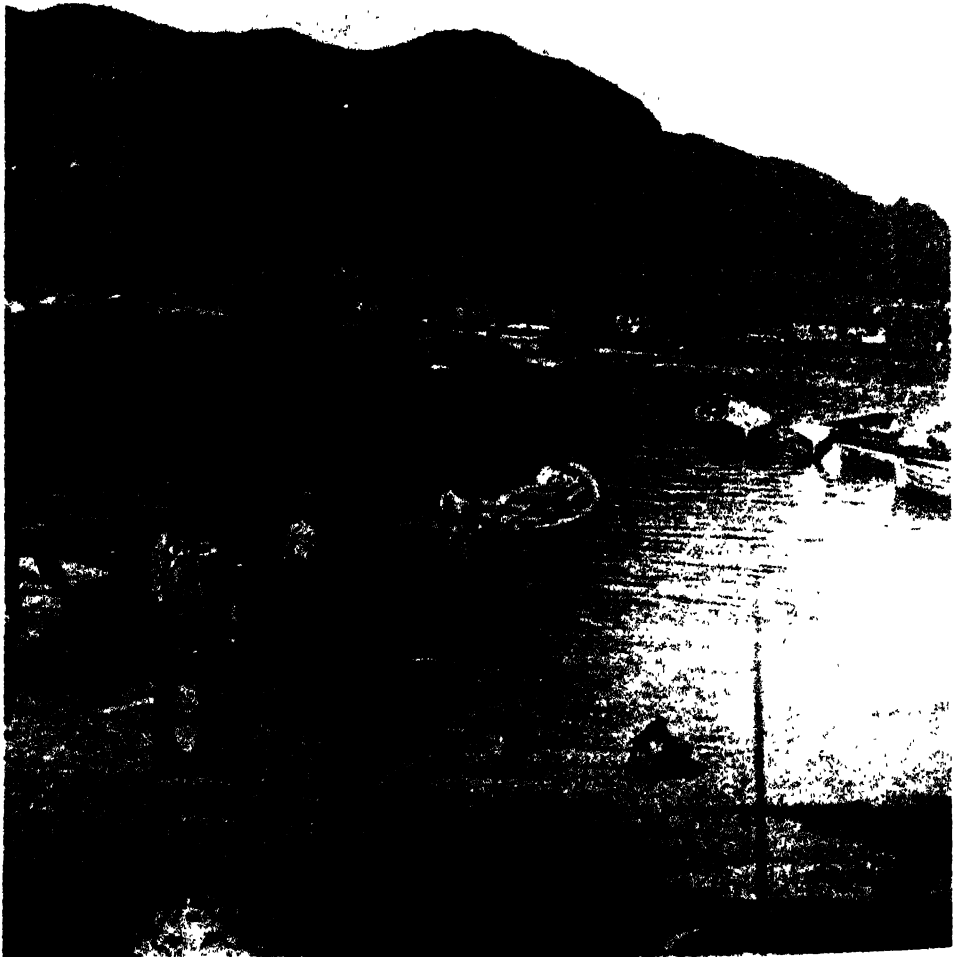
of the League of Nations. It is officially known as the TERRITORY OF WESTERN SAMOA. The most important of this group

are Savaii, 700 sq. miles in area, and Upolu, 430 sq. miles; these are the two largest islands in Samoa. Apia, on Upolu, is the chief town and administrative centre.

American Samoa. Tutuila and all other Samoan islands east of the long. 171° W., came into the possession of the United States in 1900, according to a treaty negotiated by the United States, Germany, and Great Britain, though America has had a naval and coaling station on Tutuila since 1872. Tutuila has an area of about 40 sq. miles, and a population of 7809 (1930). It has the only good harbour in Samoa, that of Pago Pago. The Manua group have a combined area of 18 sq. miles. Swains

Island was annexed in 1926 after some years of doubtful ownership. The total population of American Samoa is 10,055 (1930).

People; Resources. Most of the islands are very beautiful, with picturesque mountains, luxuriant forests, fertile valleys, and flat lands sloping toward the sea. The climate is pleasant, being most variable from May to November, although gales and hurricanes occur from January to March. The coconut palm and bread-fruit tree provide the natives with their principal food. Copra is exported. Cocoa and bananas are also grown. The native Samoans on all the islands, who number about 55,000, are the best type of Polynesians. There are also



HARBOUR AT PAGO PAGO IN SAMOAN ISLANDS

Photo: U. & U.



SAMOAN ISLES

Left - Samoan hut. The ribs are bound together with coconut fibre rope and then thatched with leaves from the same tree. *Right* - Natives braiding coconut fibre into rope.

Photos U. & U.

about 5000 Europeans, Americans, and half-castes, and a few hundred Chinese.

SAMOS, *say'mos* An island in the Aegean Sea, Greek possession of which was confirmed by the Treaty of Lausanne (1923). Samos is situated in the Grecian Archipelago, and is separated from the coast of Asia Minor by the Strait of Little Bosphorus. It formerly belonged to Turkey. The area is about 180 sq. miles, and the population, consisting almost entirely of Greeks, is 63,000. The capital, Vathy, is situated near the site of old Samos, a magnificent city in ancient times.

Olives, grapes, and other fruits are cultivated, oil, wine, silk, cotton, and figs are exported. The island contains considerable mineral wealth, marble, silver, iron, lead, and emery being found.

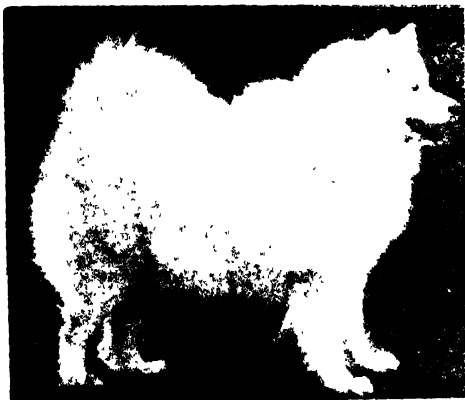
SAMOYED, *sam'o yed*. This strikingly handsome Arctic dog takes its name from the country of its origin. It is used as sledge dog and as reindeer shepherd. It is gentle by nature, easily trained, and makes a splendid companion.

The body is well covered with a thick, close, soft and short undercoat, with harsh hair growing through it forming the outer coat, which stands straight away from the body, quite free from curl.

Bred primarily for work, the Samoyed should be strong, active and graceful, and as its work lies in cold climates, the coat should be very profuse. A full-grown dog stands about 21 in. at the shoulder, and weighs 45-55 lb.

The eyes are dark, set well apart and deep, with alert, intelligent expression, eye-rims black, lips black, hair short and smooth before the ears, nose black for preference, but sometimes brown, or flesh-coloured. The jaws are strong and teeth level. The tail, long and profuse, is carried over the back.

SAMOYEDES, *sam'o yedz*. A Mongolian people living in the north of Europe and Asia between the White Sea and the Khatanga river. They were driven north from Central Asia by the Tartars in the fifth century. All told they probably number less than 30,000. Reindeer breeding, hunting and fishing are their chief occupations, and their life is largely nomadic.



SAMOYED

Photo F&U

SAMPAN. Name given to an Oriental river craft, common in certain parts of China. It is used as the equivalent of the British house-boat by a large number of families, who usually moor their craft near one of the big cities and carry on a variety of trades from it. Sampans are propelled by an oar operated over the stern.

SAMSON. A hero and the last of the tribal judges of the ancient Hebrews, famed for his great strength. (See Judges, xiii-xvi.) Samson fell in love with a Philistine woman.

when she proved faithless, he took revenge by setting fire to the fields and vineyards of her people. The Philistines retaliated by forcing Samson's countrymen to surrender him into their power. He broke his bonds,



SAMSON AND DELILAH
Painting attributed to Carpaccio
Photo: Anderson

and, with the jawbone of an ass, killed a thousand of his enemies. Later, they conspired to recapture him by locking the city gates of Gaza to prevent his escape, but he tore out doors, posts and all.

Samson's downfall finally came about through his betrayal by a Philistine woman Delilah. Coaxing from him the secret that his strength lay in his unshorn locks, she treacherously cut them off while he slept. He was imprisoned and blinded. When the great festival of their god Dagon arrived, the Philistines gathered by thousands in the temple to gloat over Samson's defeat. But during his captivity, his hair had again grown long, bringing back his former might, and he pulled down the two great pillars which supported the roof.

SAMUEL. The history of Samuel contained in the first of the two books which bear his name is a combination of two accounts made by a later editor.

The earlier story is contained in I Samuel ix-xi, and relates how a seer, Samuel, anointed Saul privately by Jehovah's command, and how afterwards Saul was chosen and crowned at Gilgal.

The later and more detailed account of his life is as follows. Born at Ramah in answer to the prayer of Hannah, he was handed over to the care of Eli, the priest at Shiloh. In a night vision the Lord revealed to the child the coming destruction of Eli's house, an intimation which was fulfilled in the defeat of Israel by the Philistines at Aphek, the fall of Eli's sons in the battle, and Eli's death on hearing of the capture of the ark.

At some time following this disaster,

Samuel was acknowledged by Israel as their prophet and judge. He summoned a national assembly at Mizpah to make confession of the people's sins. The Philistines attacked it with an army, but, at the prayer of Samuel, they were routed in a thunder storm sent by Jehovah.

After this battle Samuel judged Israel, but the people demanded a king, and, Samuel reluctantly agreeing, Saul was chosen King at Mizpah. Samuel's last public work was to announce to Saul that Jehovah's favour had departed from him on account of an act of disobedience, and the prophet then retired into private life and died at Ramah. The account of his anointing David (I Sam xvi) is by some regarded as a late addition to his story and unhistorical.

SAMUEL, SIR HERBERT LOUIS (born 1870). Liberal statesman. Born in Liverpool, he was educated at Balliol College, Oxford, of which he is an Honorary Fellow. He entered Parliament in 1902 and quickly attained office as Parliamentary Under



SAMUEL ANOINTING DAVID
Painting by Raphael in the Vatican, Rome.
Photo: Anderson

Secretary to the Home Department. There after he held a succession of offices, including those of Postmaster-General, President of the Local Government Board and Home Secretary. He lost his seat in Parliament in 1918, and two years later went to Palestine as High Commissioner, a post he held for five years. During this time Sir Herbert Samuel carried forward the scheme for establishing in Palestine a National Home for the Jewish people. In 1927 he became Chairman of the Liberal Party, and in 1929 re-entered Parliament. On the fall of the Labour Government in 1931 he joined the National Government and was appointed Home Secretary, but owing to dissatisfaction with the course of policy he resigned in the following year, and renounced

his "National" allegiance. At the General Election of 1935 he was defeated.



SIR HERBERT SAMUEL
Photo: Photopress

Sir Herbert Samuel has gained distinction not only in the field of politics, and administration, but also in that of philosophy. Among his best known writings are *The War and Liberty* (1917), *Philosophy and the Ordinary Man* (1932), and *Practical Ethics* (1935).

SAMURAI, *sah mûrî*. The military class during

the feudal period in Japan.

SANCTIONS. The instruments of coercion that secure the observance of rules of conduct. The Civil Law of Rome defines sanctions as those clauses in statutes which provide the penalties enforceable against persons who fail to comply with them.

Sanctions may take many forms, whether they operate on the body or on the purse or on the mind. The criminal law of England is enforced by fine; making the defendant contribute to the costs of the prosecution; the restitution of property to its rightful owner; corporal punishment, imprisonment, or death. Other branches of the law are supported by the award of damages to the successful party, the mulcting in costs of the unsuccessful party, restitution as above, and compulsion of the specific performance of, or granting of injunctions against, certain acts. The rules of polite society rest upon a fear of ridicule or contempt. The canons of religious law are based upon the imminence of a divine displeasure.

The law of nations, or public international law, is founded upon the fear of adverse public opinion. This opinion manifests itself in the first place in diplomatic representations by the State wronged to the State offending, and possibly also to the League of Nations. Retaliation for an act which, though not in fact illegal, is yet unfriendly is known as *retorsion*; this frequently takes the form of raised import duties. Reprisals follow a wrong recognized by law, and often their only justification is that they have been invoked by that wrong. For certain acts of aggression, however, specific sanctions have been provided by the Covenant of the League.

The first large-scale example of the im-

position of sanctions resulted from the Italian aggression in Ethiopia in 1935. Appeal having been made by Ethiopia to the League, the latter found Italy to be the aggressor and determined upon a policy of economic boycott. But there was an emphatic reluctance all over the world to exercise to the full the powers given by the Covenant, and sanctions ended in July, 1936.

SANCTUARY. A consecrated place, giving the right of protection or right of Sanctuary to persecuted persons, criminals, or debtors taking refuge there.

The custom is thought by some to have arisen from the Jewish cities of refuge, but more probably it is connected with the sanctity attached to consecrated



SANCTUARY KNOCKER AT
DURHAM
Photo: George Long

ground. The right of sanctuary was abolished in England towards the close of the seventeenth century. At Durham Cathedral and St Gregory's, Norwich, can still be seen the large knockers on the church doors, which gave the right of asylum to anyone grasping them; and other famous sanctuaries were York, Winchester, and Westminster. See **ASYLUM**.

The term sanctuary is also given to that part of a church which contains the altar.

SAND. An incoherent mass, whether or not stratified, of mineral grains, not exceeding one-fiftieth inch in diameter. Nearly all sand is derived from the disintegration of rock, and much of it from larger fragments that have been reduced in size by prolonged wear and friction. Ordinary sand is composed largely, and some sand wholly, of



FORAMINIFERAL SAND
Photo: H. E. Taylor

quartz. Much sand, however, contains numerous grains of other minerals, especially feldspar, mica, hornblende, augite, garnet, zircon, magnetite, and ilmenite; and some sand is composed almost wholly of some mineral

other than quartz. "Black sand" consists largely of metallic oxides, especially magnetite, and of native metals; some black sand is rich in gold, platinum, or other heavy metals. When sand is cemented into coherent rock by some mineral, it becomes sandstone. Sand is used as a scouring agent, in filters, in the manufacture of glass and other materials capable of being moulded, and in making plaster, mortar, and cement.

SAND, *sahNd*, GEORGE (1804-1876). A French novelist whose real name was ARMAN-TINE LUCILE AURORE DUPIN DUDEVANT. In 1822 she married a country squire, M. Dudevant, and lived an unhappy life for nine years. She separated from him in 1831, and went to Paris, where she began to write for the newspaper *Figaro*. There she met Jules Sandeau, with whom she lived for several years; they collaborated in the writing of her early books. The couple used the pen name Jules Sand, but when she wrote her first novel, *Indiana*, independently, she changed the pen name to GEORGE SAND.



GEORGE SAND
Photo: Brown Bros.

Indiana caused considerable excitement, because of its arguments against the continuance of marriage vows after affection is dead. George Sand fully lived up to her doctrines of freedom, and passed with surprising quickness from one lover to another.

Her work may be divided into five periods. Previous to 1836, she wrote such novels as *Lelia*, *Jacques*, *André*, and *Metelle*, dealing with misplaced love and with herself idealized as the heroine. Then, in the second period, from 1836 to 1840, she became interested in socialism and produced such stories of ideal government as *Mauprat*, *The Seven Strings of the Lyre*, and *Gabriel*. To the third period, extending to 1847, belong rather uninteresting political speculations, *Consuelo* and *The Countess of Rudolstadt* being exceptions. In the fourth period, she returned to her love of nature and wrote exquisite descriptions of rural life in *Little Fadette* and *The Snow Man*. During the last years of her life, she dealt once more with analysis of character and emotions in such novels as *The Marquis of Villemer* and *Flamaraude*.

SANDALWOOD. A fragrant wood yielded by several species of trees growing in the East Indies and other tropical islands. The variety most generally seen is white sandalwood, but yellow and red sandalwoods are also marketed. Sandalwood is used in making cabinets and chests and small objects of an ornamental nature, such as fans and fancy boxes. Incense sticks are also made from it. Because of the heavy fragrance of the wood, insects will keep away from clothing stored in sandalwood chests. Sandalwood oil, obtained by distillation, is used in perfumes and medicinally. The heartwood of red sandalwood yields a colouring matter used in dyeing wool; it is also employed as the basis of certain tooth powders.

Classification. Sandalwood belongs to the family *Santalaceae*, and the white species is called *Santalum album*.

SAND-EEL. Two species of this fish, the lesser and greater sand-eels, are common in British seas, though the former is oftenest seen. Typically eel-like in shape, these fish are sometimes seen in enormous numbers on the warm sandy shallows off the coasts and are widely used by anglers as baits for other fish.

They are preyed on by sea-birds and by almost every flesh-eating fish. They are of no commercial or food value.

Scientific Name: *Ammodytes lanceolatus* and *lobianus* (greater and lesser varieties respectively).

SANDERLING. A small bird belonging to the sandpiper group, but unlike the other sandpipers in that it has no hind toe.

The sanderling breeds in Arctic and sub-Arctic regions, but migrates southwards in winter, and many may be found on suitable shores almost anywhere in north and south temperate regions, even in such widely separated places as Britain and New Zealand.

Scientific Name. The sanderling belongs to the family *Scolopacidae*; it is *Crocethia alba*.

SAND-GROUSE. The name of a group of game-birds. They are not true grouse, but are said to be intermediate between grouse and pigeons. There are only about sixteen species and all are found in desert regions. Sand-grouse are very powerful in flight and travel long distances for their daily drink of water, but they can also run very rapidly despite their short legs. The toes are broad and adapted for walking on soft sand.

Pallas's Sand-Grouse, which inhabits the desert regions of Central Asia, occasionally migrates in large numbers into Europe.

Scientific Name. The sand-grouse belongs to the family *Pteroclididae*.

SAND-MARTIN. See MARTIN.

SAN DOMINGO. See SANTO DOMINGO.

SANDPIPER. A common name given to a large number of birds belonging to the plover family.

A number of species are found in Britain, some rare, others quite common. Of the latter the common sandpiper is a summer



SANDPIPER

Photo: John Kearton

visitor to northern England and Scotland, where it nests by the shores of streams and lochs. It is a small, brownish-coloured bird with white underparts. The purple sandpiper is a common winter visitor from its breeding grounds in the tundra of the far north. It is generally found in little colonies near the water's edge along rocky coasts of the north.

Scientific Names. The common sandpiper is *Tringa hypoleucos*; the purple sandpiper is *Calidris maritima*.

SANDSTONE. A rock composed of grains of sand cemented together by some substance, which may be carbonate of lime, silica, iron or clay. The particles of sand in many cases were cemented under great pressure and under the influence of heat, though the temperature was not high enough to melt the substances.

The colour of sandstone varies from light grey or white to dark brown. Varieties in which silica forms the cement have a glassy appearance, and in some localities, this stone is quarried for use in the manufacture of glass. Some sandstones are soft when taken from the quarry, but harden on exposure to the air. The fine-grained varieties are used in making grindstones and whetstones. Among the best-known kinds of sandstones is the *Old Red Sandstone* of Great Britain.

Sandstone is a popular building stone because it is durable and easily worked, but has not been regarded as sufficiently strong for massive structures.

SANDWICH, EARLS OF. A title of nobility borne by members of the Montagu family. Edward Montagu, admiral and general, fought on the Parliamentary side in the Civil War, but on the Restoration made his peace with the Stuarts and was rewarded by the Earldom of Sandwich (1660). He was second in command during the Dutch Wars, and was killed when his flagship was blown up in Solebay (1672). He was buried in Westminster Abbey.

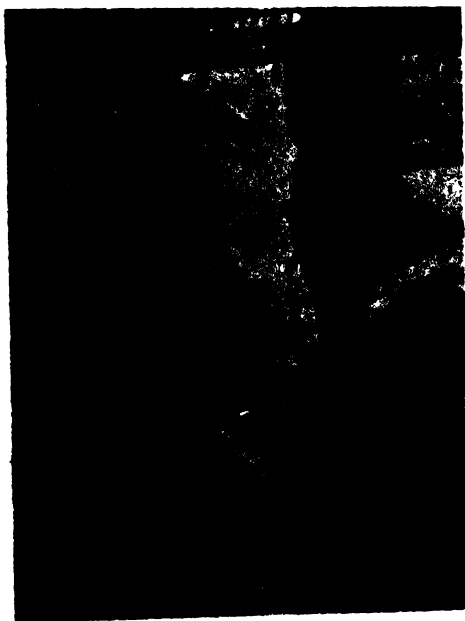
The fourth Earl, John, was First Lord of the Admiralty in 1748 and Secretary of State in 1763. He was to a large extent responsible for the system of political nepotism and jobbery which marked the period when the Whig oligarchy held power.

SANDWICH ISLANDS. See HAWAII.

SAN FRANCISCO, CALIFORNIA. The principal seaport of the Pacific coast of America. The entrance to San Francisco Bay from the Pacific is the Golden Gate.

Population in 1930 was 634,394, an increase of 25.2 per cent since 1920.

San Francisco grew to importance during the Californian gold-rush in the mid-nineteenth century. Much of the city was destroyed by an earthquake in 1906, but it was soon rebuilt.



DENUDED SANDSTONE ROCKS NEAR TUNBRIDGE WELLS

Photo: George Long

San Francisco is the terminus of the Southern Pacific, the Santa Fe, the Western Pacific and the great Northern railway lines. There are regular lines of steamships plying between San Francisco and the Orient. The Panama Canal is increasing the ocean



SAN FRANCISCO'S CHINATOWN
Photo: U. & U.

traffic between San Francisco and New York and other Atlantic ports. The Bay between Oakland and San Francisco is now spanned by a bridge 8 miles long.

The principal exports include dried and canned fruit, mineral oil, barley, raw cotton, sardines, and apples. The chief industries are printing and publishing, the preparation of coffee and spice, slaughtering and meat packing, the manufacture of motor vehicles, canning and preserving, and the making of furniture, confectionery, and clothing.

SANHEDRIN, *san' he drin*, also called **SANHEDRIM**. The supreme national council of the Jews, with authority over religious, civil, and criminal cases. It was established about the period of the Maccabees (which see). At the time of Christ, it was made up of seventy-one members; they were presided over by an official whose title was "Father of the House of Justice," and met daily near the Temple in Jerusalem. The members were chosen from different classes of society, eminent learning being the sole requisite for admission. Minor courts were set up all over the country by the Sanhedrin.

Jesus was tried before the Sanhedrin as a false prophet, and Peter, John, Stephen, and Paul appeared before it on charges of religious error. After the fall of Jerusalem, in A.D. 70, the Sanhedrin declined in power, and finally disappeared.

SAN JOSÉ, *san ho' say*. Capital of Costa Rica (which see).

SAN JUAN, *san hwahn*. The capital city of Puerto Rico (which see).

SANKEY, **FIRST VISCOUNT** (born 1866) Lord Chancellor of England 1929-1935. He was educated at Lancing College and Jesus College, Oxford. Called to the Bar in 1892, he took silk in 1909 and became a bencher of the Middle Temple five years later. His progress in the courts was rapid, his legal knowledge and skill bringing speedy recognition and reward. In 1914 he became a Judge of the King's Bench Division and was made a Lord Justice of Appeal in 1928.



LORD SANKEY
Photo: Fox

He was appointed Lord Chancellor in the Labour Government, 1929, although he had no seat in either the Commons or Lords. He was a British member of the Permanent Court of Arbitration at the Hague, 1930 and was Chairman of the International Relations Committee of the Imperial Conference, 1930.

SAN MARINO, *mā re' no*. One of the smallest republics in the world, it claims to be the oldest republican State in Europe. It was formally acknowledged an independent State in 1631 by Pope Urban VIII. San Marino lies in the Apennines in North-eastern Italy, about 12 miles south-west of the port of Rimini, on the Adriatic Sea to which an electric railway runs. It has an area of about 38 sq. miles, and a population of 14,067 (1935). The chief occupations of the people are the raising of cattle and the making of wine. Stone is exported. The little republic issues its own postage stamps and coins.

The legislative assembly of the republic is a Great Council of sixty members, elected by popular vote. Every six months, two executive officers, called Regents, are selected from the Council members, and a smaller executive council of twelve members is chosen from their number every year. A treaty of friendship, negotiated with Italy in 1907, was renewed in 1914, and



SAN FRANCISCO

The skyscrapers in the foreground stand on Nob Hill, 300 feet above the business quarter and waterfront, in the background.

Photo Aerograph Co



SAN MARINO FROM OUTSIDE THE CITY WALLS

Photo: P. & A.

San Marino followed Italy in declaring war against Germany in the World War. The citizens of the little republic were permitted to enlist in the Italian army.



SAN MARINO
Government Building fronted by the Statue
of Liberty.
Photo: P. & A.

SAN SALVADOR. Capital city of Salvador (which see).

SANSKRIT LANGUAGE AND LITERATURE. Sanskrit is the ancient sacred and literary language of India. It is divided into two periods—Old Sanskrit, called Vedic Sanskrit, or more properly Vedic, in which the *Vedas* were written, and classical Sanskrit, the literary remains of which are chiefly on subjects other than religious. 1500 B.C. is the date generally assigned to the introduction of Sanskrit into India. For a period, it was the common speech of the people, as well as the literary language, but by the third century B.C., several local dialects were in use. As early as the sixth century B.C., Buddha used a local dialect to preach his doctrine. The literary idiom ceased to be understood by the common people, and in this more or less artificial and classical form it exists to-day. Since Sanskrit came to the knowledge of Europeans, in the latter half of the eighteenth century, it has exercised a profound influence on the scholar-

ship of the world. Comparative philology, comparative mythology, and comparative religion are the direct outgrowth of its study. For Sanskrit, by the very fact that it has survived through so many centuries as a merely formal speech, has not been subject to the constant changes which creep into the common speech of a people, and, consequently, preserves in purer form than any other of the Indo-European languages the characteristics of the common stock from which these all sprang. See **PHILOLOGY**.

Sanskrit possesses a literature well worthy of study for its own sake. In a wider sense, this literature includes the *Vedas*, the sacred Hindu books which constitute the oldest

० काकौ वृक्षे वसतः ॥ देवो वदति
० किमर्थं मृत्तरम्पुत्रो न स्मरति

SPECIMEN OF SANSKRIT

Translation (a) Two crows dwell in the tree (b)
The god speaks. (c) Why does the son not
remember the father?

work in any Indo-European language. Sanskrit literature proper, as distinguished from the Vedic, is entirely secular, as stated above, and its greatest monuments are the epics known as the *Ramayana* and the *Mahabharata*. Other epics less noteworthy than these exist, together with lyric and didactic poetry, narratives, and even dramas. Though the Hindus claim a great antiquity for their drama, there seems no real reason for placing its beginnings before the fifth or sixth century of the Christian Era. Nor is it possible to state that it was entirely a product of that country, many scholars seeing in it distinct traces of Greek influence.

Most interesting of all, however, are the beast fables and fairy tales, for in these is evident a very close connection with such narratives in European languages. India seems to have been one of the earliest homes of the fable, and practically every *motif* which is found in European tales of this type exists in some form in Sanskrit literature.

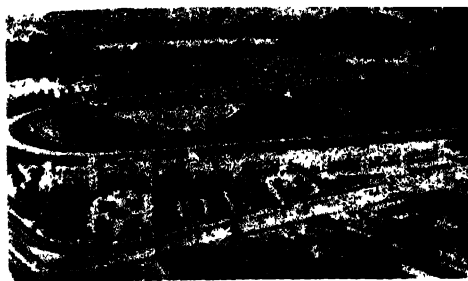
SAN STEFANO. *stay' fa no*, TREATY OF. The treaty which concluded the Russo-Turkish War of 1877-8; afterwards modified at the Congress of Berlin. By this treaty the state of Bulgaria was first set up.

SANTA CLAUS. A figure of legend derived from the cult of Saint Nicholas of Myra, the patron saint of children. In some European countries, more particularly in England, the feast of the Saint on 6th December was celebrated by children by the election of a boy bishop, who, vested in pontifical robes, led a procession through the streets to the Church, where he presided

over all services until Holy Innocents' Day (28th December). The custom was abolished in England by Queen Elizabeth, but the name of Saint Nicholas, popularly shortened to *Santa Claus*, was still associated here, as in other countries, with the Christmas festivities, until it gave way in England to that other legendary figure "Father Christmas."

SANTA, OR SAINT, SOPHIA. See MEHAN-IDIE MOSQUE.

SANTIAGO, *san te ah' go*. The largest city of Chile, the capital of the republic and also of the province of Santiago. It is one



SANTIAGO: THE RACE COURSE
Photo: Photopress

of the oldest cities in South America, having been founded in 1541.

The city has boot and shoe factories, flour mills, breweries, and tanneries. Its population of 696,231 (1930) makes it one of the largest cities on the Pacific coast. The city suffered severely from a great earthquake in 1906.

SANTO DOMINGO, OF DOMINICAN REPUBLIC. The eastern and larger of the two republics on the island of Hispaniola or Haiti. This island was the first claimed by Spain, following its discovery by Columbus. Santo Domingo has an area estimated as 19,332 sq miles, and a population (1935) of 1,478,121. It became a republic, independent of Haiti, in 1844. Agriculture is the main source of wealth to the republic. Sugar, cacao, tobacco, coffee, and cotton are the principal products and exports. The mountain slopes provide suitable grazing for cattle. Copper, gold, silver, manganese, iron, and rock salt occur, but are little worked.

Interior facilities for communication and transport are as yet inadequate, as there are few roads and only two short railways.

Santo Domingo, the capital (since 1936 CIUDAD TRUJILLO), was founded in 1496 by Bartholomew Columbus, brother of the discoverer. The city is a seaport on the south of the island, and is typically Spanish. Many natives dwell in thatch-covered cottages, but

the ruins of great stone mansions tell a story of former grandeur.

Santo Domingo is important for the export of coffee and sugar. The population is 71,297 (1935).

SANTOS, *sahn' tosh*. See BRAZIL.

SANTOS-DUMONT, *sahn' los du mon'*, ALBERTO (1873-1932). An early leader in the development of the flying machine, born at São Paulo, Brazil. His first experiment in flying was made in 1897, in a spherical balloon. A year later, he had perfected a dirigible balloon with a petrol motor and screw propeller in the basket, but its first trial ended in failure. In 1899, with another balloon, the young man made a long, successful flight, which included the circling of the Eiffel Tower.

Santos-Dumont won the Henri Deutsch prize of 100,000 francs in 1901, for his trip from the Aero Club around the Eiffel Tower, which he made in a little over 30 min. The following year, he attempted unsuccessfully to cross the Mediterranean.

SAO THOMÉ, *sou N to' may*, AND PRINCIPE, *prin' se pay*. Two Portuguese islands lying 150 miles from the Guinea coast. They have a combined area of 315 sq. miles and a population of about 1000 Portuguese and 50,000 negroes and coloured people, most of whom are on São Thomé. The islands are volcanic and with a warm climate throughout the year and heavy rain from September to June are very fertile. São Thomé was the world's chief producer of cocoa until 1912, when the Gold Coast eclipsed it.

SAP. In botany, the term applied to watery liquids which may be moving up or down the stems of plants. Sap carries both mineral and organic foods used by the cells in various parts of the plant.

The stem and root of a tree consist of a woody interior portion, which is ensheathed by a layer of bark. In the wood of both root and stem are many conduits, through which the sap moves. These conduits, which always stand vertically in root or stem, differ greatly in number and size from species to species.

The surface cells of the roots take in the water from the soil by a process known as *osmosis*. This water which is taken in is not pure water, but contains numerous minerals in solution. From the surface cells of a root, the water, with the dissolved minerals, moves radially inward, by osmosis, until it reaches the conduits in the wood of the root. It then moves up through the conduits in the root, and from there into the conduits of the stem, and finally passes to the leaves. The force which causes the water and dissolved minerals (the sap) to ascend in the conduits is a pull, resulting from the

evaporation of water from the leaves. In young trees, the water moves through conduits in all parts of the wood; in old trees, on the other hand, the conduits toward the centre of the trunk are blocked, and the sap moves only through conduits in that portion of the wood which lies adjacent to the bark. This portion of the wood (the sapwood) can usually be distinguished from the portion through which the sap does not move (the heartwood) as sapwood is usually light-coloured, whereas heartwood is much darker in colour.

Leaves are the organs of the plant in which carbohydrates are manufactured from carbon dioxide and water, and these carbohydrates in solution constitute another stream of sap which moves down the trunk. This sap ordinarily differs from that ascending the trunk in that it contains carbohydrates in solution. At certain times of the year, and in certain trees, as the sugar maple, the ascending sap may contain sugars or other carbohydrates in solution.

Economic Uses. Many plants yield sap of economic value. The sugar of commerce is made from the sap of the beet and the sugar cane; and from the sap of the sugar maple, syrup and sugar are obtained.

SAPAJOU, *sap' a ju*. A group of American monkeys of the genus *Cebus*.

SAPPHIRA, *saf fi' ra*. See ANANIAS.

SAPPHIRE, *saf' ire*. A transparent blue gem, ranking next to the diamond in hardness, and approximately equal to that stone in value. Sapphires vary in colour from pale blue to deep indigo, but the most valuable stones have the tint of the cornflower. Yellow and white specimens, with the blue distributed in spots, are not uncommon. The sapphire is a variety of corundum, and is of about the same composition as the ruby. The chief sources of the gem are Siam, Burma, Ceylon, Kashmir, United States, and Australia. The gem is the birthstone for September. See GEMS.

SAPPHO, *saf' o*. A Greek lyric poetess who lived in the seventh and sixth centuries B.C. She spent most of her life in Lesbos, as head of a coterie, or school, of girls who devoted themselves to writing verse. Aristotle ranked her with Homer, and Plato called her the "tenth Muse," while Solon, on hearing one of her poems read, exclaimed that he would not willingly die until he had learned it by heart. Her lyrics were passionate songs of love and nature, and were arranged in nine books, one for each of the nine Muses. Of her poems, a beautiful *Ode to Aphrodite*, and an ode descriptive of the emotions of love have been preserved apparently entire. Various fragments remain.

SAPROPHYTES, *sap' ro fites*. Organisms,

e.g. the higher fungi, which live on dead or decaying vegetable matter.

SARACENS, *sar' ra sens*. A name applied to various peoples by European writers of the Middle Ages. The Mohammedans of Palestine and Syria, the Arab Moors who set up a kingdom in Spain in the eighth century, and the Seljuk Turks, against whom the Crusaders fought, were all known as Saracens. The name was originally applied by the Greeks and Romans to wandering Arab tribes of the Syro-Arabian desert.

SARAGOSSA, *sar ra gos' a*. See SPAIN.

SARAJEVO, *se rah' yay vo*. Capital of the Austrian province of Bosnia in 1914, when Archduke Francis Ferdinand and his wife were assassinated there. See BOSNIA AND HERZEGOVINA; SERBIA.



SAPPHO

Sculpture at the Louvre, Paris

Photo: Visual Education Service

SARASVATI, *sar' ras wah te*. Hindu goddess of eloquence, and consort of Brahma. See BRAHMA.

SARATOGA SPRINGS, SURRENDER OF. See BURGONYNE.

SARATOV, *sa rah' tof*. See RUSSIA.

SARAWAK, *sa rah' wak*. An independent State under British protection; it lies on the north-west coast of Borneo, adjoining Dutch territory. The area is about 50,000 sq. miles and the population number about 475,000, mainly Malays, Dyaks, Kenyahs and Muruts with many Chinese and some Indians. From a low coast the land rises through hills to a mountainous interior. Climate is hot and rainy throughout the year. Rice, sago, fruits, and rubber are cultivated. Fishing is important. Oilfields have recently been opened near Miri and there is much export. Coal occurs on Brunei Bay, over which the British North Borneo

Company has rights. The chief town is the port of Kuching. Transport is by river, a few roads and many bridle paths. The territory was acquired in 1842 by Sir James Brooke from the Sultan of Brunei and added to in 1861 and 1905. In 1888 it was placed under British protection, but the Sultan, the grandson of Sir James Brooke, is the sole ruler.

SARCOMA, *sar ko' ma*. See CANCER.

SARCOPHAGUS, *sar kof' a gus*. A stone coffin which is usually placed in a vault or chapel, instead of being buried. The sarcophagi of the ancient Egyptians, who regarded these caskets as the homes of their dead, are the oldest known. The bodies of the kings who built the pyramids for their tombs were placed in wooden coffins, and these coffins were placed in hollowed-out blocks of granite. Later, the sarcophagus was fashioned to resemble the swathed mummy. The Greeks, Etruscans, etc., followed the custom of elaborately decorating the sides of their stone coffins with figures in relief.

The name, which is from a Greek word meaning "flesh-eating," refers to an ancient belief that coffins made out of a certain stone found in Asia Minor would consume the bodies placed within them, in the space of forty days.

SARDANAPALUS, *sar dan a pay' lus*. See ASSURBANIPAL; ASSYRIA.

SARDINE. Name given a small olive-green fish of the herring family. Sardines appear in the markets preserved in oil and canned. They are found in greatest abundance along the coasts of the Mediterranean Sea and the coast of the Bay of Biscay. The name, in fact, is derived from the circumstance of their having first been caught in large numbers off the island of Sardinia. They are in reality young pilchards. See PILCHARD.

How Sardines are Tinned. The fish are washed, dried, and placed in boiling oil; then drained and packed in tin boxes which are filled with pure olive or other oil. After the lids are soldered on, the boxes are placed in boiling water or subjected to the fumes of hot steam. *Sardines anchoisées*, or sardines cured in red wine, are a delicacy known in the south of France.

Scientific Name. The European sardine is the young of *Clupea pilchardus*.

SARDINIA. A mountainous Italian island in the Mediterranean Sea. The island of Corsica, a possession of France, lies directly to the north, the two islands being separated by the Strait of Bonifacio, 9 miles wide. Including the coast islets, Sardinia has an area of 9299 sq. miles. It is irregularly

oblong in shape, is 168 miles in length, and about half as wide. Population (1931), 973,125.

Commercially, Sardinia is important chiefly for its minerals and agricultural products. Lead, silver, zinc, antimony, lignite, granite, and salt are the chief products of the mines. Wheat, oranges, olives, lemons, and grapes are raised on the fertile plains between the mountains, and cattle-raising has become important. About one-fifth of the land is forest-covered. The island has railway facilities, and carries on a prosperous foreign trade, exporting minerals, wines, goatskins, olives, salt, and fish, and importing coal, cotton and woollen goods, and a variety of manufactured articles.

For administrative purposes, Sardinia is divided into two provinces, Cagliari and Sassari. The capital of the island is Cagliari, a city of 101,869 (1931). See following article.

SARDINIA, KINGDOM OF. Once a province of the Roman Empire like the other Mediterranean islands, Corsica and Sicily, Sardinia remained attached to the Eastern Empire until it was overrun by the Saracens. The island was reconquered by Pisa and later, in the fifteenth century, on the fall of the maritime power of that city, was ceded to Aragon and was governed as a viceregal kingdom.

In the fifteenth century, Sardinia was united with Sicily and Naples as the Kingdom of the Two Sicilies under the Spanish monarchy, but in 1713, after the War of the Spanish Succession, Sardinia and Naples passed into the possession of the imperial house of Austria, while Sicily was given to the Duke of Savoy.

By the Treaty of London in 1720 the Emperor Charles VI exchanged Sardinia for Sicily with the Duke of Savoy, and the latter then assumed the title of King of Sardinia. Thus began the association of Sardinia and the House of Savoy under which eventually the unification of Italy was accomplished. When in 1861 Victor Emmanuel assumed the title of King of Italy, the Kingdom of Sardinia became absorbed in the larger unity and ceased to exist independently.

SARDONYX, *sar' don iks*. An ornamental stone, one of the forms of quartz, consisting of alternate layers of white and red or reddish-brown, the red layers being partially transparent carnelian. Sardonyx is a variety of onyx. It was formerly used for the stone in signet rings. It is supposed that a sardonyx was one of the stones in the breastplate of the high priest of the Israelites (Exodus xxviii. 20), but we do not know whether the name was then given to the same stone as now.

SARDOU, *sar doo'*, VICTORIEN (1831-1908). A French dramatist, born in Paris.

As a young man he gained a livelihood successively as tutor and as a writer of reviews and articles for popular encyclopedias. Later he wrote plays with astonishing rapidity. These were chiefly comedies, characterized by wit, clever satire, rapid movement, and easy dialogue. Among his early successes were *Candide* and *Fédora*. *Diplomacy* is the best known.



SARDOU
Photo: Brown Bros.

SARGAS'SO SEA. The name given to that part of the North Atlantic Ocean where slack-water lies between the trade wind drifts on the east and south, the Gulf stream on the west, and the North Atlantic drift on the north. Its limits cannot be accurately defined and are continually changing. Approximately they may be given as lat. 25° N. and 30° N., and long. 45° W. and 75° W. In this area there is no current and calms are the normal occurrence. The surface of the sea is covered with a floating layer of gulf-weed, *Sargassum bacciferum*, which is an alga with many air vesicles on the flattened fronds. Many stories have grown up around this sea, of drifting galleons, forgotten vessels, and so forth. No sailing-ship willingly enters a large area of habitual calms, but steamers pass through the sea unimpeded. The weed is certainly not able to entrap any vessel.

SARGENT, JOHN SINGER (1856-1925). A well-known portrait painter of American parentage born at Florence in 1856. Having first studied art in Italy he went to Paris and became a pupil of Carolus Duran, followed by a visit to Spain to study the works of Velazquez and other Spanish artists. Settling in London in 1887, Sargent



J. S. SARGENT
Photo: Brown Bros.

rapidly rose to eminence as a portrait painter, and in 1897 was elected a Royal Academician.

His works show the influence of Velazquez and Tintoretto in their sense of form, richness and exuberance of colour. Brilliant examples of his work, which rivals Hals in characterization, are seen in his portraits of the Wertheimer family, "Ellen Terry as Lady Macbeth" and others in the Tate Gallery.

SARGON. See ASSYRIA.

SARK. See CHANNEL ISLANDS.

SARSEN STONES, OR GREY WETHERS.

These are large siliceous blocks of sandstone found on the surface of the ground in Berkshire, Wiltshire, and the adjacent country. They are derived from a tertiary sandstone which once covered the area but has all been removed by denudation except these blocks, which happened to be cemented with silica. In some places they are so numerous that they look like a flock of sheep, whence the name of grey wethers. Windsor Castle has many blocks of sarsen in it, and sarsen stones are often used for steps and gateposts, etc. The outer circle of Stonehenge and the great trilithons are sarsen stones probably obtained locally by prehistoric man.

SARTO, ANDREA DEL (1486-1531). A Florentine painter of the Italian High Renaissance. He was an especially fine colourist; his style was dignified and his drawing masterly. His real name, according to some accounts, was ANDREA VANUCCI, but he was nicknamed Del Sarto, meaning "tailor's son," because of his father's trade. He studied under several Florentine masters, and before he was 30, painted a series of seven frescoes in the Santa Annunziata, the church of the Servites at Florence. These paintings were followed by another notable series of frescoes, illustrating ten scenes from the life of John the Baptist. In 1510 he received a commission from Francis I of France to purchase works of art, but was accused of squandering the money entrusted to him, and was thenceforth forbidden to return to France. He spent the remainder of his life in Florence.

The most celebrated of his single pictures are the "Madonna del Sacco," for the Servites; the "Last Supper," in the refectory of the Convent of San Salvi, near Florence, and the "Madonna of the Harpies," now in the Uffizi Gallery. The National Gallery has his fine "Portrait of a Sculptor."

SASKATCHEWAN, *sas kach' e won*. A province of Canada, formed in 1905 from the eastern half of the District of Athabaska and the greater part of the districts of Saskatchewan and Assiniboia. The western boundary is long. 110° W.; the southern boundary, lat. 49° N.; the northern, lat. 60° N.; and the eastern boundary deviates only slightly from long. 102° W.



AN AERIAL VIEW OF SASKATOON
Photo: Canadian Official News Bureau

Area and Population. The area is 251,700 sq. miles, of which 8892 sq. miles are water.

The People. In 1901 the old District of Saskatchewan had 91,279 inhabitants; in 1911 the province had 492,432 inhabitants; this number increased to 757,510 in 1921, and according to the census of 1931 the population was 921,785. In 1911 there were 1.95 inhabitants to the square mile, and in 1931 the density had increased to 3.66. However, the settled portion of the province is confined to the southern half, so the number of people to the square mile for the part of the province that is settled is greater than the foregoing figures indicate. The rural population is about double the urban. Regina (pop. 53,209) is the capital city.

Surface and Drainage. The western part of the province lying between the Saskatchewan River and the United States boundary consists of open, rolling prairie and gently rolling plain. The region is dotted here and there with lakes and clumps of trees, and there are wide treeless plains.

That part of the province extending to the northern forest belt and east and north of a line drawn from the intersection of 102° long. and 49° lat. to the Alberta boundary is a large area of mixed prairie and woodland.

Much of the region between the Saskatchewan and Churchill rivers is a parklike country suitable for agricultural purposes. North of the Churchill, the country is comparatively

low and flat, with a light, sandy soil. Forests cover most of this region as far north as Lake Athabaska. The highest altitude in the province is in the Cypress Hills, where a peak rises to 4790 ft.

Rivers and Lakes. The southern and central parts of the province are drained by the Saskatchewan, the Assiniboine, the Souris, and their tributaries. The Qu'Appelle (*Who Calls*) River runs eastward across the southern half of the province, and empties into the Assiniboine just beyond the boundary of Manitoba. The Churchill River flows across the central part, and drains a chain of lakes, of which Reindeer Lake is the largest.

Saskatchewan has thousands of lakes varying greatly in size and in the nature of their waters. Those in the prairie districts are more or less alkaline.

Plants and Animals. The open country in the park and prairie regions is covered with grasses which make excellent hay. Between the Saskatchewan and the Churchill rivers are large forest areas, which constitute about one-third of the province, although much of it is not commercial timber. There are thirteen forest reserves comprising 9217 sq. miles and national and provincial parks covering about 2000 sq. miles. All forests are owned and administered by the provincial government. Timber is sold by license or public auction. Poplar, birch, and jackpine predominate on the highland, spruce and tamarack on the lowland. North

of the Churchill the forest is chiefly coniferous.

Animals. In the forests are found the bear, the wolf, the mink, the otter, the fox, the skunk, and the musk-rat, all valuable for their fur. The Saskatchewan government has enacted stringent game laws. Elk, moose, and deer roam the forests in the north, and the pronged antelope is found in the south-west.

Minerals and Mining. There are large deposits of lignite near Estevan and along the Souris River in the south-eastern part of the province. Coal mines are worked near Wood Mountain, and deposits have been discovered west of Saskatoon. The annual output is nearly a million tons. Around Beaver Lake there is copper. Platinum has been discovered in Northern Saskatchewan. Gold, silver, and petroleum are known to exist in the province.

Agriculture. Saskatchewan is by far the leading province of the Dominion in the production of wheat, and the second in the production of livestock. The yield of wheat in 1935 was 135,000,000 bushels out of Canada's total of 277,000,000 bushels, and of oats 132,000,000 out of 394,000,000. Other important grains are oats, barley and rye. Flax, potatoes, root crops and small fruits are grown. Grass and other forage crops are abundant, and contribute largely to the success of the livestock industry in the northern and eastern sections.

The south-west, within the area affected by the chinook winds, is especially suited to raising horses and cattle, since stock can be pastured throughout the year. The park land is destined to become a great dairy region. Horses, beef cattle, sheep, and swine are raised in large numbers and the poultry industry is not inconsiderable.

Manufactures. Manufacturing is still in the early stage of its development. The leading products are lumber, bricks, paper products, flour, non-metallic minerals, and vegetable and animal products. The province has great water-power possibilities; more than 1,000,000 h.p. is available but only 44,500 h.p. has been developed.

Transport and Communication. Two great railway systems—the Canadian Pacific and the Canadian National (government)—traverse the province from east to west. Besides its main line, each system has numerous branch lines; the settled portion of the province is thus well supplied with railways. The most important railway centres in this section are Regina and Moose Jaw, in the south; Saskatoon, in the centre, and Prince Albert, in the north. From Regina a line goes north-east through Manitoba to Churchill on Hudson Bay. There are a

little more than 8600 miles of railway in operation.

Government. The provincial government is headed by a lieutenant-governor, appointed by the Governor-General of the Dominion. There is one legislative chamber, consisting of sixty-three members, elected by the people from the various constituencies for a term of five years.

The province is represented in the Dominion Senate by six members, in the House of Commons by twenty-one members. Women may vote and hold office.

History. Saskatchewan was a part of the vast territory which, under the name of Rupert's Land, was controlled by the Hudson's Bay Company. Long before there was any attempt to found settlements in the country north and west of the Great Lakes, this company had established trading stations around Hudson Bay and far inland to the south and west. Between 1811 and 1817, a permanent settlement was founded in the valley of the Red River, under the direction of the Earl of Selkirk, who had obtained a controlling interest in the Hudson's Bay Company. This settlement, which was in the present province of Manitoba, constituted the beginning of the political organization of the great Canadian North-west. Soon after the organization of the Dominion of Canada in 1867, measures were taken to secure control of the Hudson's Bay Company's rights, and these rights were purchased the following year for £300,000, with certain reservations to the company.

The entire region north and west of the provinces of Ontario and Quebec became known as the North-west Territories (now North-west), and was divided for the purpose of administration into a number of districts. In 1870 the province of Manitoba was organized. With the completion of the Canadian Pacific Railway in 1885, immigration began to flow into the vast fertile region. In 1905 the provinces of Alberta and Saskatchewan were organized.

A local uprising, headed by Louis Riel, occurred after the opening of the country to settlement. It was known as the Saskatchewan Rebellion. See articles in Dominions Volume.

SASSOON, THE RT. HON. SIR PHILIP, THIRD BARONET (born 1888). Under-Secretary of State for Air from 1924 to 1929, and in the National Government set up in 1931. He was private secretary to Field-Marshal Sir Douglas Haig, Commander-in-Chief of the British Army in France, 1915 to 1918, subsequently he became Parliamentary Secretary to Mr. Lloyd George. He has been Chairman of the Board of Trustees of the National Gallery since 1933; of the

Wallace Collection and of the Tate Gallery. The family's history is a romance of the East. About the twelfth century they settled in Toledo bearing the name of Ion Shoshan. Driven from Spain by persecution, they went to Bagdad in the fifteenth century.



SIR PHILIP SASSOON
Photo: T. O. A.

The head of the family became chief of the Jews of Mesopotamia and held the title of Nasi, or "Prince of Captivity." Further persecution drove them later to Bushire in Persia. In 1832 they established themselves as bankers in Bombay and became wealthy Indian merchants, also operating in China and Japan. David Sassoon in 1858 sent his third son Sassoon David Sassoon to London.

His eldest son Albert, a member of the Bombay Legislative Council, was made a K. B. in 1872, came to England the following year and was created a baronet in 1890 for his services to charity and education.

SATAN. See DEVIL.

SATEEN. See SATIN, below.

SATIN. A glossy, silken fabric, which is woven in such a way as to reduce the number of crossings of weft or warp; when the fabric is run between hot rollers, it acquires its unbroken, glossy surface. Satin is made plain, damasked, glossy surface. Satin is made plain, damasked, open-worked, striped, or embroidered, and may have a plain or crêpe back. Dresses, underwear, hats, ribbons, shoes, and soft furnishings are some of the articles for which use is made of satin, from the thin, washable kinds to the heavy, stiff Duchess satin. The chief centres of satin manufacture are Lyons, in France, and Genoa and Florence, although large quantities are now made in Great Britain and the United States. Cotton imitations in the satin weave are known as *saleens*.

SATIRE. The name given by the Romans to a type of poem in which men and manners were held up to ridicule or scorn, often of the most scathing sort. With some poets, the object of the ridicule was to better the conditions which they satirized; with others, mere bitterness underlay the writing. Lucilius originated the poetical form.

Although Elijah's taunts of the prophets of Baal on Mount Carmel are examples of scathing satire, Juvenal, perhaps, is its most famous master. His biting comments on the

vicious life of Rome have been imitated by a number of later poets. Horace excels in a gentler type of satire; but Martial in his epigrams can be very bitter. Several centuries earlier Aristophanes had been delighting the Athenians with his satirical comedies.

Literature declined during the Dark Ages, and it was not until the tenth century that it began to revive. English satire is first notably presented by William Langland in *Piers Plowman*, in which he railed against the clergy and the law courts. Dryden's *Abraham and Achitophel* and *MacFlecknoe*, Johnson's *London*, and Pope's *Dunciad* are among the great satirical poems in English, while Swift's *Gulliver's Travels*, in prose, is one of the greatest satires in any language. To these names must be added Butler and Addison, Cowper, Byron (in *Don Juan*), and Burns. Among French masters of this art were Rabelais, Molière, and Voltaire; in Germany, Richter and Heine; in Spain, Cervantes; in Norway, Ibsen; in Sweden, Strindberg; and in Russia, Gogol. In the United States, Lowell, Holmes, and Mark Twain made much use of satire.

SATRAP, *sat'rap*. See PERSIA.

SATURATION, *sat'uray'sh'n*. See EVAPORATION; HYGROMETER; SOLUTION.

SATURDAY. The seventh day of the week, called *Saturn-day* by the Anglo-Saxons. It is named after the Roman god Saturn, and is the only day named after a Roman deity. Saturday is the Sabbath day among the orthodox Jews and Adventists.

SATURN. In Roman mythology, a god identified with Kronos (see KRONOS) youngest of the Titans and son of Uranus and Gaea. His name was derived from *sero*, meaning "I sow." Saturn presided over agri-



SATURN

A conception by Rubens in the Prado, Madrid.

Photo: Anderson

culture. Having overthrown his father, the legend relates, he became ruler of the universe, and was happy until the birth of his first child. Then he remembered that an oracle had declared that he should be dethroned by his child, and to prevent this disaster, he swallowed the babe. Four other children met a like fate. When Jupiter, the sixth and last, was born, the mother concealed the babe and gave Saturn in its stead a stone, wrapped in child's clothing, which he swallowed without noticing the substitution. When Jupiter grew up, he dethroned his father and banished him to Italy, where he set up a prosperous kingdom. See SATURNALIA.

SATURN. The sixth planet in distance from the sun, and next to Jupiter in size. It was known to the ancients and marked their boundary of the solar system. Its average distance from the sun is 886,000,000 miles, but there is a range of 100,000,000 miles between the greatest and least distances, because of the eccentricity of its orbits. Saturn rotates on its axis in 10 hours 14 minutes, and revolves round the sun in twenty-nine and one-half years. Its surface is about eighty times that of the earth, its volume 730 times; but its density is only one-eighth the earth's density. The surface temperature is about 250° below zero, F.

Saturn appears as a big yellow star. The planet has nine, possibly ten, satellites, and is surrounded by a system of rings inside the satellites.

Saturn's Rings. The peculiarity of Saturn's Rings was noted by Galileo and Huyghens, the latter believing only one ring to be present. Now, however, it is known that the planet is surrounded by three concentric rings, composed of myriads of separate meteoric particles, each particle moving in

its own orbit round the planet. The outer and larger ring has an exterior diameter of about 170,000 miles, and a width of probably 10,000 miles. The exterior diameter of the inner ring is about 145,000 miles. They are not over 10 miles thick.

The Satellites. The system of which, Saturn is the centre is enormous. The largest of the ten satellites, Titan, was discovered by Huyghens in 1655. Its distance from Saturn is about 760,000 miles, and it has a diameter of approximately 2500 miles. Another of Saturn's satellites, Iapetus, is 2,200,000 miles from the planet, and revolves round it in about seventy-nine days. The ninth satellite has a retrograde motion. The tenth and smallest was claimed to have been discovered in 1905, but its existence has not been confirmed.

SATURNALIA, *sat' ur nay' lia*. An ancient Roman festival in honour of the god Saturn. The festival began on 17th December and, under the Caesars, lasted seven days. The first day was devoted to public religious rites, and sacrifices were offered to Saturn; on the second day was offered the usual family sacrifice, a young pig. The festival was entirely one of mirth. The schools observed holidays, no public business could be transacted, the courts of law were closed, no criminal could be punished, and banquets and family gatherings were held. The Saturnalian festival were participated in by the slaves, who were considered free for the time. The last days of the festival were devoted to visiting and giving presents. Little clay images, called *sigillaria*, and wax tapers called *ceres*, were the principal gifts.

SATYR, *sat' ur*. In Greek mythology, name given a god of the woods who had a man's head and body, but the ears, legs,



SATURNALIA
Sculpture by Ernesto Biondi in the National Gallery, Rome.
Photo: Allinari

feet and tail of a goat. At first, satyrs were sometimes represented as repulsive in appearance, animal-like in habits, and a terror to the nymphs of the wood. In later representations, they appear as graceful youths

with pointed ears, goats' hoofs, and a small tail. Satyrs are associated with the worship of Dionysus, and their leader was Pan.

SAUDI ARABIA, *sah u' de*. See HEJAZ; NEJD.

SAUER-KRAUT, *sour krout*. See CABBAGE.

SAUL. The Son of Kish. Following Samuel, the last of the Judges, Saul was chosen King of Israel because of the growing nation-consciousness of the tribes. His reign was

one of continual war. Gathering together the fighting men of Israel, and aided by his son Jonathan, he fought successful battles with Amalek, and Israel's more powerful enemies the Philistines. But in the end the latter were too strong for him, and at the battle of Gilboa he suffered a heavy defeat, his two sons were slain, and he himself, seeing the day was lost, fell upon his sword. He had accomplished a highly important work, wherein lies his significance in Jewish history. He had made the foundation of a unity, on which his successor David was able to build, and prepared the way for the consolidation of the nation, which David afterwards brought about.

SAUL OF TARSUS. See PAUL.

SAUROPOD, *saw' ro pod*. See DINOSAUR.

SAVAGE, RICHARD (d. 1743). Savage was a picturesque rogue who wrote poetry and plays and a vast amount of venomous satire. Most of his satire (e.g. *The Bastard*) was directed against Mrs. Brett, formerly Lady Macclesfield, whose illegitimate son Savage claimed to be. (Investigation has shown that he was probably of humble birth.) His poem *The Wanderer*, has some poetical merit.

He had an adventurous life. He nearly married Sir Richard Steele's daughter, and once was in danger of being hanged for killing a man. He was a great friend of Pope's for a time, but afterwards fell out with him, as he did with most of his friends. He was in the running for the poet laureateship with Colley Cibber, and although he was not appointed he was awarded a pension of £50 a year by Queen Caroline. He died in great poverty. His most famous friendship was that with Dr. Johnson, who wrote a sympathetic and yet truthful biography of him.

SAVANNA, *sa van' a*. A tract of land covered with vegetation which consists chiefly of tall, stiff grasses growing in dense tufts, and low trees irregularly distributed. The pampas of South America, the prairies of Central North America, the steppes of Europe, and the plains of Central Africa are all savannas, varying somewhat in character of vegetation.

SAVINGS BANKS. Most of the first "banks" established to encourage thrift and to keep secure the savings of depositors were charitable institutions, but in 1810 a Dumfriesshire clergyman, Henry Duncan, established a self-supporting savings bank which was more on the lines of the institutions now known as savings banks. Seven years later, legislation first dealt with these banks in the United Kingdom. Early savings-bank history is marred by the number of frauds of various officials. Agitation that savings banks should be placed under the direct control of the State eventually resulted in the formation of the Post Office Savings Bank by the Post Office Savings Bank Act, 1861.

The Savings Bank Act, 1863, is the principal Act dealing with other organizations such as trustee savings banks in which management and property is vested in trustees, but there have been frequent amendments. The main provisions are for two trustees, managers, or paid officers to be present on all occasions of public business transacted by the trustee savings bank, for a half-yearly audit of the accounts, for a meeting of trustees half-yearly, and for a weekly return to be sent to the National Debt Commissioners. The rate of interest allowed on deposits is about 2½ per cent.

SAVONAROLA, *sav on a ro' la*. GIROLAMO (1452-1498). He belonged to the nobility, and joined the Dominican Order at Bologna, in 1475. His birthplace was Ferrara.

In 1482 Savonarola began to preach—fiery outbursts of indignation against the wickedness of the world. He went from Ferrara to Florence, then to Brescia, and again in 1490 back to Florence. In the



SATYR
A late Roman conception.
Photo: Mansell

following year, he was elected prior of St. Mark's. Lorenzo de' Medici, of the reigning house, unsuccessfully tried to win over Savonarola to his side, and the story is related that Savonarola refused to grant absolution to Lorenzo while the latter was dying. Thereafter, the Piagnoni, or democratic party, came into power, and Savonarola was strengthened by their support. The invasion of Charles VIII of France added to the confusion, and hastened the destruction of the Medici. Savonarola's influence helped also to free Florence from the French.

A great change swept over the city of Florence while Savonarola, as dictator, swayed the emotions of the people by his puritanical exhortations. After a short



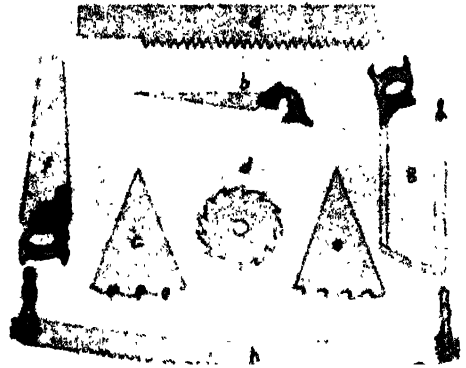
SAVONAROLA

Terra-cotta by Giovanni Bastianini
Photo. Victoria & Albert Museum

time his popularity waned. Pope Alexander VI had not escaped the reformer's attacks, and, fearful of his increasing power, decided to excommunicate him. On the return of his enemies to power he was forced into retirement and later imprisoned for heresy, tortured and finally put to death with great cruelty.

SAVOY, HOUSE OF. The oldest reigning European dynasty, to which all the kings of United Italy have belonged. The house was founded by Humbert, first Count of Savoy in the eleventh century. See **ITALY (History)**.

SAW. A cutting tool consisting of a metal blade, one edge having teeth set at slight angles to enable them to cut through wood, stone or metal.



SAWS

(a) Gang-saw blade. (b) Compass saw. (c) Section of inserted tooth circular saw. (d) Circular grooving saw. (e) Section of chisel-tooth circular saw. (f) Handsaw. (g) Meat saw. (h) Crosscut felling saw.

A circular saw consists of a circular plate of tempered steel, armed with teeth. This saw is now used in most timber mills of average size. The saw, often as large as 7 ft. in diameter, is revolved by machinery and is capable of sawing through 200 ft. of wood, board measure, per minute. Circular saws are now made to cut disk-shaped pieces of wood, as well as straight flooring boards and building material. This type of saw was patented in England, in 1777, by Samuel Miller.

SAWFISH. A family of fish, probably transitional between the sharks and the rays. Their chief characteristic is the possession



SAWFISH



SAXON ARCHITECTURE
Doorway of St. Peter's Church, Monkwearmouth, Sunderland, constructed in A.D. 674.

Photo. Sunderland Corporation

of a flat, swordlike snout, which is used as a weapon of offence and defence. Each side of the "saw" is provided with a series of sharp teeth, and with it a sawfish viciously tears open the bodies of its victims. There are five species, distributed through the warm parts of the ocean. They grow sometimes to over 15 ft. in length including the saw, which may be 6 ft. long. The sawfish belong to the family *Pristidae*.

SAXE-COBURG-GOTHA. See WINDSOR, HOUSE AND FAMILY OF

SAXIFRAGE, *sak' si frayj*. A family of plants which flourish in stony soil or in clefts of rocks; so called because of the unfounded belief that they cause rocks to disintegrate. *Saxifrage* is from Latin words meaning "stone breaking." The species, for the most part, are found in cold and temperate regions of the northern hemisphere. They are favourite rock garden plants. The leaves of some European forms are eaten as salad, and the root is used medicinally. These hardy plants have stalks from 4 in. to 2 ft. high, while the foliage varies, being mossy, leathery-leaved, or silvery. The

many tiny seeds are enclosed in capsules, and the blossoms are of all colours.

SAXONS, THE. This race came from the southern shores of the Baltic and from Denmark. In the later years of the Roman occupation they made piratical raids on Britain and, after the Romans had left, they came as invaders. They settled chiefly in southern Britain, as can be seen from the names of their early kingdoms—Wessex, Sussex, Middlesex, and Essex, the lands of the Western, Southern, Middle and Eastern Saxons. Their architecture was a crude form of the Romanesque.

SAXONY. A state in eastern Germany on the border of Czechoslovakia. Area 5786 sq. miles; population, 5,196,652 (1933). The people are of pure Teutonic stock, but there is a small proportion of Germanized Slavs and a number of Wends. In religion the people are Protestant, and of the Lutheran denomination. Educationally, the State is one of the most important in Germany. Leipzig has a great university and a famous music school, and Dresden is noted as an art, musical, and literary centre.



REGIERBURG IN SAXONY
Photo. German State Railways

Saxony is in the central mountainous region of Germany, and though there are lofty summits in the Erzgebirge, the land is hilly rather than mountainous. The River Elbe is the only stream of any commercial importance.

Agriculture is highly developed, though the farms are small; the main products are wheat, rye, barley, oats, potatoes, and hay. Orchards, vineyards, and flax fields also flourish. Among mineral products, silver, coal, iron, lead, marble and precious stones are important. About one-fourth the total area is covered with forests.

However, manufactures and mining occupy the first places in the interests of Saxony. Besides the prosperous textile factories at Chemnitz and Dresden, Saxony makes furniture, paper, watches, glassware, pianos, machinery and many other commodities. At Meissen, Dresden china is produced.

Government and History. The name Saxony was originally applied to a large area in North-western Germany inhabited by the Saxons, and this territory was quite distinct from the modern kingdom. It was late in the Middle Ages before the name was applied to the present state. The present limits of Saxony were defined in 1814 by the Congress of Vienna, after the defeat of Napoleon at Leipzig. Saxony joined the North German Confederation at the close of the Seven Weeks War, in which it was allied with Austria against Prussia, and in 1871 Saxony became a member of the German Empire.

During the World War the people of Saxony suffered particularly, owing to their inland position and lack of food. Parliamentary conflicts continued until the beginning of the revolution, on 9th November, 1918, when a republic was proclaimed. In April, 1919, the workers proclaimed a Soviet Republic in Leipzig, but it was dissolved within a month and a new constitution was adopted the following year. In 1933 the constitution was suspended and the State was placed under the absolute rule of a governor.

Saxony is also the name given to a province in Prussia. The Grand Duchy of Saxony (also called Saxe-Weimar), formerly a State of the German Empire, united with Thuringia in 1918 to form a federated state.

SAXOPHONE, *sak' so fōn*. A deep-toned brass-wind musical instrument, which has become extremely popular since the introduction of "jazz" music. Its name comes from that of Adolphe Sax, who invented it in 1840. The instrument is a conical tube, in its larger sizes curved upward at the bottom

and having a small part turned backward at the top, where the mouthpiece and a single reed like that of the clarinet are fitted. Twenty keys are arranged on its uncurved length, which are manipulated by the first three fingers of each hand. Saxophone music is written in the treble clef, but all saxophones are transposing instruments (i.e. sound at a different pitch to that written). The main sizes are the Soprano in B \flat , the Alto in E \flat , the tenor in B \flat , and the Baritone in E \flat ; the alto being the chief solo instrument. The tone is sweeter than that of the clarinets, and admirably suited to its place in dance music. It is also much used in military bands.



SAXOPHONE

SCAB. A disease of animals. See MANGE.

SCABIES, *skay' be eez*. See ITCH.

SCABIOUS, *skay' be us*. The name of various common wayside flowers whose improved forms make popular garden plants. Usually lilac or purple, the flowers are sometimes red or white, and rarely yellow. They are usually in a very tight flat cluster at the top of the stem, which may be two feet high. The stem is hairy; the leaves vary in shape but are chiefly from the root, those from the stem being as a rule deeply cut. The plant is perennial and flowers from July until the end of the summer.

Scientific Names. The scabious is in the *trache* family *Dipsacaceae*. It forms the genus *Scabiosa*.

SCAFELL, *shaw fel'*, **PIKE**. The highest point of land in England, height 3210 ft.

SCALDS. See BURNS AND SCALDS.

SCALE. See MUSIC; and in another sense **WEIGHING SCALE**.

SCALES. The thin, flat plates which form the outer covering of most fishes and of many serpents and lizards. Those of the reptiles are hardened folds of the epidermis, whereas, with most bony fishes, the scales are developed from the under skin. A few mammals are also scale-covered, such as the scaly ant-eater. Scales consist usually of a horny substance, and they overlap one another like roof tiles, forming a protective armour for the softer body.

In botany, scales are flaky leaves which

cover buds on trees and plants in cold and temperate climates, to shield them from sudden changes in temperature. The regular sections of fir cones have the same name.

SCALLOP, *skal' ūp*. A bivalve shellfish related to the oysters. The two halves of the shell covering are shaped like fans, and in some species they are marked with prominent ridges which radiate from the hinge. The

zigzag fashion, with the broad end of the body forward. See MOLLUSCS.

Scientific Name. Scallops belong to the family *Pectinidae*.

SCAMMONY, *skam' o ni*. A twining climbing plant, native to Asia Minor, with white flowers and thick, fleshy roots, usually 2 or 3 ft. in length. From the roots is obtained a milky, white juice, which, upon drying and hardening in the air, forms a gum resin of medicinal value. It is used in laxative preparations.

Scientific Name. Scammony belongs to the morning-glory family, *Convolvulaceae*. Its botanical name is *Convolvulus scammonia*.

SCANDINAVIA. The name given in a restricted sense to the peninsula of Norway and Sweden, but more broadly used to designate the lands inhabited by Scandinavian people, viz. Denmark, Norway and Sweden. The word *Scandia* originated with the Romans, who used it to describe a large island believed to be north of the Baltic Sea. The southernmost portion of Sweden is still known as Scania; that it was connected with the mainland at the north was not known to the Romans.

SCANDINAVIAN LITERATURE. A comparison of the literatures of the three principal Scandinavian countries shows that Norwegian literature is richer and possessed of greater national vitality than that of Sweden or Denmark. The dramatist, Strindberg, is a famous figure in Swedish literature and the Danish teller of fairy tales, Hans Andersen, has a world-wide reputation. But neither Sweden nor Denmark has anything to rival the early literature of Norway written in Old Norse or the writings of the "Big Four" in the nineteenth century.

A comparison of the three literatures reveals other points of interest—

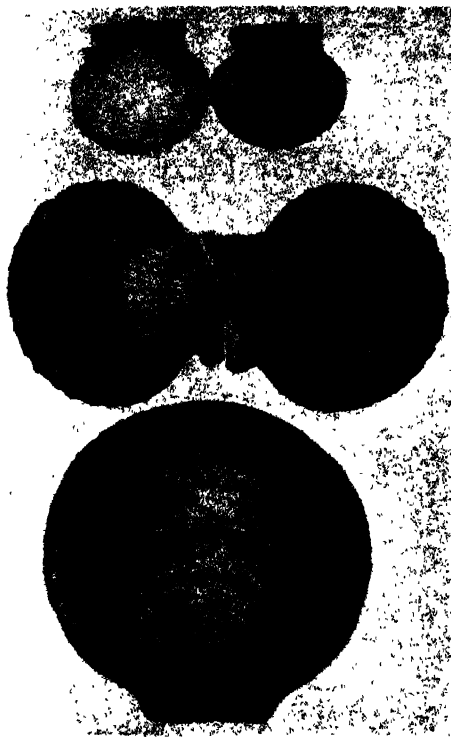
1. The revival of the tradition of the Old Norse literature and language in the eighteenth century, beginning with the Norwegian writer, Holberg.

2. The new departure in Swedish literature in the last years of the nineteenth century which produced the great writer Strindberg.

3. The constant interaction between the literatures of Norway, Sweden, Denmark, and the other European countries.

Norwegian Literature. After the union of Denmark and Norway in 1380, Norway ceased to be a sovereign state, and its native language, Old Norse, was replaced by Danish, which continued for centuries later to be the language used by Norwegian writers. The Landsmaal movement, which began in the nineteenth century, aims at restoring native Norwegian.

Ludvig Holberg (1684-1754) is famous for



SCALLOP SHELLS

Top: outer and inner surface. Centre: upper and lower surface. Bottom: upper surface of plainer specimen.

Photo: Visual Education Service

shell ends in a earlike extension, in which the hinge is placed. Along the margin of each mantle fold (the membrane lining the shell) is a row of slender tentacles and a fringe of bright-blue eyes. Adult scallops have a rudimentary foot with which they plough through the mud. In swimming, the animal opens the valves quickly, catching a quantity of water between the mantle folds, and then closing its shell. Because of pressure within, the water is forced out in jets through round openings on the hinge, and the resulting movement against the water outside pushes the animal along in a

his work in bringing back the lost Old Norse tradition into Norwegian literature. His plays, *Jeppe on the Hill*, *The Tinker Politician* and *Love without Stockings* are especially well known. Holberg studied at Oxford University, and was deeply influenced by English life and character.

The Romantic Movement in Norway in the early years of the nineteenth century is represented by some outstanding writers, including Henrik Wergeland (1808-45), Johan Welhaven (1807-73); and the two friends Peter Christen Asbjørnsen, the famous teller of Norwegian folk-tales, and Jørgen Moe, who used folk material in his poetry.

The Romantic writers were followed by the realistic novelist Madame Collet (1813-95) and by the "Big Four," Jonas Lie (1833-1908), Alexander Kielland (1849-1906), Henrik Ibsen (see *IBSEN*), and Bjørnson (1832-1910), who was outstanding as a poet, novelist, and dramatist.

Among authors later than the "Big Four" may be mentioned Knut Hamsun, famous for his novels *Pan* (1895) and *The Growth of the Soil* (1917).

Danish Literature. The *Gesta Danorum*, the chronicles of the historian Saxo Grammaticus (c. 1150-1206), are an outstanding work in the earliest period of Danish literature. The *Gesta Danorum* were translated into English by an Elizabethan author, with the result that the story of Hamlet was made familiar to English people.

For many centuries later than the greatest writers in the Danish language were Norwegians. It is not until we come to the early nineteenth century that we meet with a Swedish writer of world-wide reputation. This writer is Hans Christen Andersen (1805-75), famous as a writer of fairy stories based on adult ideas.

Swedish Literature. The seventeenth century produced a writer of genius in Georg Stiernhielm (1598-1672), whose epic poem written in hexameters, *Hercules*, has high literary value.

In the Romantic movement which inevitably followed the classicism of the eighteenth century the highest place is held by Per Atterbom (1790-1855), whose chief work is a poetic drama, *The Isle of Bliss*.

New life was given to Swedish literature in the last years of the nineteenth century by contemporary literary movements and scientific discoveries and speculations in the rest of Europe, among which may be mentioned the novels of the French realistic author, Zola, the drama of the Norwegians, Ibsen and Bjørnson, and the work of the English thinkers, Darwin, Spencer, and J. S. Mill. The greatest representative of the new

Swedish literature is Strindberg. See *STRINDBERG*.

SCANDIUM, *skan' dium*. See *CHEMISTRY* (Table of Elements).

SCAPA FLOW. A sea basin of the Orkney Islands, Scotland, whose narrow entrances made it an easily defensible base for the Grand Fleet during the World War.

SCAPEGOAT. One of two goats received by the Jewish high priest on the Day of Atonement, upon which he casts lots, one for Jehovah and one for Azazel (Leviticus xvi 8-10). The first was killed as a sin offering, and upon the second, or scapegoat, the priest laid his hands, confessing over him the people's sins and then sending him into the wilderness as a token that the sins had been put away. The original significance of "Azazel" has been lost, but it is thought to refer to an evil spirit supposed to dwell in the desert.

In current speech, a person made to bear the blame of others is called a scapegoat.

SCAPULA, *skap' u la*. In anatomy, the shoulder blade. See *SKELETON*.

SCARAB, *skar' rab*. A beetle held sacred by the ancient Egyptians. The scarab belongs to the subfamily of dung beetles. These



SCARAB EGYPTIAN CARVING.
Photo Mansell

beetles have the habit of breeding in refuse, which they sometimes form into small balls and roll to their underground burrows, to be used as food. The egg is laid in a pear shaped pellet, distinct from the food-ball. The Egyptians regarded the scarab as a form of the sun-god "the self-begotten," since the young beetles seemed to come into existence out of nothing. The food-ball which they confused with the egg-pellet was regarded as a symbol of the sun itself. The scarab was also a symbol of the resurrection and of immortality, and figures of the insects, also known as scarabs, were carved out of stone or made of glazed composition and used as

charms. Scarab amulets are found in Egypt in large numbers, but there are many modern forgeries.

Classification. Dung beetles belong to the large family *Scarabaeidae*.

SCARBOROUGH. An Urban District and watering place on the Yorkshire coast, with an area of 2727 acres and a population of 41,791 in 1931. It has two bays, both with extensive sands, separated by the Castle Hill on which stand the ruins of the fine Norman Castle. The old town retains its street names—Friar's Entry, Merchant's Row, Cook's Row—links with the Middle

seventeenth century (see MONTEVERDE, and Music). He developed the new style in a manner very important to the subsequent course of music, adding a fullness and body lacking in some of the earlier composers. He wrote over a hundred operas, in addition to numerous concertos for orchestra, and much church music.

SCARLATTI, DOMENICO (1685–1757). Italian composer, son of Alessandro, better known to-day than his father, thanks to his many hundreds of attractive sonatas for the harpsichord; he also wrote a number of operas. See Music.



SCARBOROUGH, THE SOUTH BAY
Photo: Scarborough Corporation

Ages when it was an important trade centre. Previously it was one of the strategic points of the Danish invasion and one of their largest seaports. Under the Normans, and later, it attained immense influence and special privileges were extended to its merchants. For nearly five centuries it returned two Members to Parliament. Apart from the old red-roofed town itself, much that is ancient remains. King Richard House was visited by that king, and the "Three Mariners' Inn" is reputed to have been a favourite haunt of smugglers. During the past century it has become an important holiday resort. The herring fisheries, however, still employ a large amount of labour. Tunny fishing is a sport growing in popularity. Scarborough is also a modern and up-to-date spa.

SCARLATINA, *shar la te' na*. See SCARLET FEVER.

SCARLATTI, ALESSANDRO (1658–1725). Italian musician and composer; studied at Rome under Carissimi, who was one of the pioneers of the new Italian music of the

SCARLET FEVER. OR SCARLATINA. An acute infectious disease to which children, especially those between the ages of 5 and 10, are particularly susceptible. It is very contagious, and its after effects are always a source of danger to children.

Transmission and Symptoms. The specific organism that causes scarlet fever is contained in the ear, nose, and throat secretions of patients. The germs are transmitted by direct contact, by the handling of articles soiled by the discharges, and sometimes through polluted milk. The onset is sudden. An attack begins with vomiting, headache, fever, and sore throat, and within twenty-four hours to forty-eight hours later, a rash appears on the neck and chest. The eruption begins as tiny red spots, which soon are spread over the body. A characteristic sign of scarlet fever is the appearance of the tongue, which is described as strawberry-like. When an attack runs its course, the rash usually starts to fade in three or four days, and is entirely gone in seven or eight. Peeling then starts, and continues for two

or three weeks. The scales are not ordinarily a source of infection.

Treatment and Prevention. The throat is the organ which must be watched and treated with the greatest care. A victim of this disease should be isolated immediately after the attack begins, placed in a quiet, well-ventilated room, and put on a liquid diet. Measures are adopted to control the fever and antiseptic sprays for the throat are used.

Among the dangers connected with scarlet fever are ear complications, resulting in



SCHILLER'S STUDY AT DRESDEN
Photo. OROC

impaired hearing and sometimes mastoid disease. The heart and kidneys are other organs frequently affected.

SCARLET PIMPERNEL. See PIMPERNEL.

SCEPTICISM, *skap' ti siz'm* or *s-*. See METAPHYSICS.

SCHAUMBERG-LIPPE, *shoum' berg lip'e*. A state of Germany with an area of 136 sq. miles and a population of 49,955 (1933). It is mainly agricultural and contains no large towns. As in other German states the constitution has been set aside, and in 1935 the state was put under the absolute rule of a governor who is the personal representative of the Chancellor.

SCHEELITE, *sheel' ite*. An ore of calcium and tungsten. See TUNGSTEN.

SCHELDT, *shell*. An important commercial waterway of Europe. It rises in the northern part of France in the department of Aisne, entering Belgium near Bléharies. In Belgium it follows a north-easterly course until it reaches Antwerp, below which it separates into two channels, the East and West Scheldt. These form a double estuary, which flows into the North Sea. The river is 250 miles in length, and has been made navigable for about 210 miles by means of locks. It is connected by canals with the chief cities of France and Belgium.

SCHERZO, *skairt' zo*. Musical term, literally "a jest." It is applied to a light and rapid form of third movement in a sonata or symphony (which see). It was first popularized by Beethoven, whose ideas of musical humour are somewhat rough and tempestuous. The famous Scherzo of his *Ninth Symphony* is among the most striking examples of the form. See also MUSIC.

SCHILLER, *shil' er*, JOHANN CHRISTOPH FRIEDRICH VON (1759-1805). A German poet, born at Marbach, Württemberg. When 17 years old, he began to write his romance, *The Robbers*, a play that awakened great interest in Germany when published in 1780. At 21 years of age, he had written a treatise *On the Connection of the Animal and Intellectual Nature of Man*, which was discussed by leading European scientists.

When, in 1782, *The Robbers* was performed at Mannheim, in Baden, Schiller, then an army surgeon, secretly left his regiment to see it, and was arrested by the military authorities. He soon escaped from prison, and in a remote village wrote two other plays, *The Conspiracy of Fiesco* and *Cabal and Love*. Afterward, he ventured to return to Mannheim. There he conceived the ideas for the plot of his drama *Don Carlos*, and went to Dresden to prepare himself for the task by close historical study of the United Netherlands. The play was presented at Leipzig in 1789, and gained him national fame. This success won him also the friendship of Goethe, who procured for him the professorship of philosophy at the University



SCHILLER
Photo. Brown Hrs

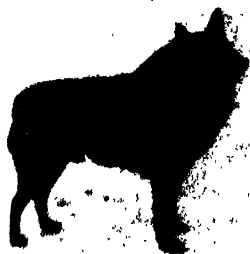
of Jena. It seemed for a time that the poet was lost in the scholar, but after 1795 he produced many spirited ballads and songs.

In 1799 Schiller again wrote a masterpiece for the stage in his *Wallenstein*, and during the next two years composed the famous tragedies, *Maria Stuart* and *The Maid of Orleans*. In 1804 he reached the climax of his power as a writer of dramas in his powerful *William Tell*.

SCHIPPERKE, *ship er' ke*. The schipperke was imported from Belgium in 1887, and quickly became popular. It has been used as a barge-dog for hundreds of years,

makes an excellent guard, and is a splendid rat-ter. It is very adaptable to surroundings.

The Schipperke is a small cobby animal with a sharp expression, presenting the appearance of being always on the alert



SCHIPPERKE
Photo Fall

The head is foxy in type, nose black and small, eyes dark brown, small, oval, bright and full of expression, ears tapering at the point carried stiffly erect, chest broad and deep in bristlet, the forelegs straight and well under the body, feet small and cat-like, and standing on the toes, the nails black, the hindquarters fine in comparison with the foreparts, muscular and well-developed thighs; the tailless rump is well rounded. Weight, about 12 lb. The coat is black, abundant, dense and harsh, but smooth on the head, ears and legs, lying close to the back and sides, but erect and thick round the neck, forming a mane and frill

SCHIST, *shist*. In geology, a general name for metamorphic rocks which have a fissile character caused by films or folia of various minerals. They are found chiefly in regions composed of very ancient and greatly disturbed strata such as the Highlands of Scotland, Anglesea and the Sperrin Mountain of Ireland. Mica schist, hornblende schist, talc schist, graphitic schist and chlorite schists are named after the minerals forming the layers together with quartz, feldspar and garnets. Schists are often very crumpled and contorted.

SCHLESWIG-HOLSTEIN, *shels' vig hol' shlin*. A former province of the kingdom of Prussia, in the southern portion of the peninsula which separates the Baltic and the North Seas. It was then divided into North

and South Schleswig, the former being largely Danish in population. Since 1920, a section in the north has belonged to Denmark. The German portion now forms the Prussian province of Schleswig-Holstein, which has a total area of 5819 square miles and a population of 1,589,824 (1933).

Originally, the province consisted of two Danish duchies, Schleswig in the north and Holstein in the south (separated by the River Eider), and the Danish language continued to predominate in the northern sections. At the close of the Seven Weeks War, the two duchies became a part of Prussia (1866). The effort to Germanize the northern portion only strengthened the Danish national consciousness. The Treaty of Versailles enacted a plebiscite in 1920 which restored to Denmark the northern part of Schleswig (Slesvig), with an area of 1500 sq. miles. In 1930 it had a population of 177,696. The people are engaged chiefly in farming.

SCHLEMMANN, *shle' mahn*, HEINRICH (1822-1890), German archaeologist. He made valuable contributions to the knowledge of early Grecian civilizations. As a youth he shipped as cabin boy for Venezuela but the wreck of the vessel landed him in Amsterdam where he studied languages. The firm employing him sent him to Russia, where he set up for himself and made a fortune. In 1868 he devoted himself to archaeology and in 1870 began to excavate what he thought to be the site of Troy. He continued work here until his death. He also started excavations in 1876 on the site of Mycenae in Greece and in 1877 unearthed the five tombs which in the days of Pausanias were believed to be those of Agamemnon and his companions. His published volumes include *Ithaca, the Peloponnesus, and Troy*, concerning the site of Troy; *Trojan Antiquities*, and *Mycenae*.

SCHMALKALDIC, *shmal' kal' disk*, LEAGUE. A defensive alliance formed at Schmalkalden, Prussia,

in 1531, for the support of religious and political freedom of Protestants, and in opposition to the Emperor Charles V and the Roman Catholic states. See REFORMATION, THE.

SCHNAUZER, *shnou' zer*. There are three types of Schnauzer, giant, medium and miniature, identical but for size. The stiff whiskers



SCHNAUZER
Photo Fall

and bushy eyebrows characteristic of the breed give the appearance of fierceness, but the Schnauzer is far from fierce. He is always happy, and an excellent watchdog and ratter. An ancient German breed, it has been popular in Austria, Switzerland, etc., for many years.

The coat, thick, strong and wiry, is pepper-and-salt, iron grey or black in colour, and the tail is docked short. On the Continent ears are cropped to give an erect appearance, but cropping is not permitted in this country, and here the ears are small drop V-shape, carried moderately high, and close to the head.

SCHOLASTICISM, *shol as' ti sis'm*. A name which distinguishes the type and method of philosophy taught and practised during the Middle Ages and to-day carried on by philosophers within the Catholic Church. It may be said briefly that the end of scholastic philosophy was to find a rational basis for religious belief and practice and to aid the study of theology.

Although there were christian theologians even from the earliest times who held a type of Platonic philosophy, they concentrated on trying to find the exact meaning of revelation and how it was concerned with belief and the Church.

About the ninth century Alcuin and others gave up trying to evolve mystical meanings and endeavouring to find the explanation for all things in revelation, and began to use logic and reason alone, apart from revelation.

Scotus Erigena, a Scotsman, gave a great impetus to this new method, and he was followed by such men as Abelard and Peter the Lombard, whose *Sentences* was the work which Saint Thomas Aquinas, the Dominican philosopher who had been taught by Albert the Great and the greatest scholastic of all, was to use as the basis for his early lectures. In the thirteenth century the Moorish Mohammedan doctors brought the philosophy of Aristotle to the West, where up till this time it had been neglected. Averroes was the most famous of these, and many Christian philosophers became his enthusiastic followers. Saint Thomas Aquinas, studied new translations from the original Greek that he might reply to the Averroists. So taken was he by the Aristotelian philosophy that he evolved a new scholasticism based on Aristotelianism.

Though he was succeeded by other great philosophers such as Duns Scotus, scholasticism began to decline, and at the time of the Reformation a bare hair-splitting dialectic was the fashion.

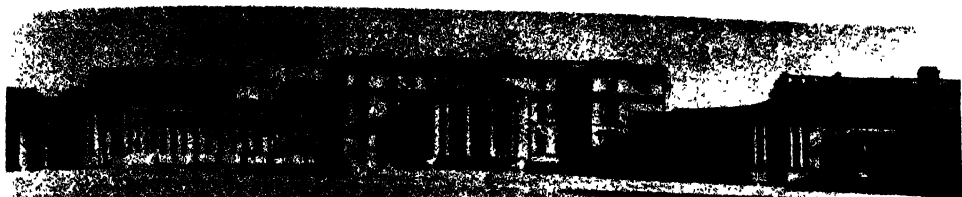
Later days brought a return to the Thomistic philosophy as interpreted by the Jesuits Suarez and Vasquez.

SCHÖNBERG, *shön' berg*, ARNOLD (born 1874). Viennese composer, and leader of one of the most distinct schools of modern music. His early works are Wagnerian in style and have charm. But in later life he underwent a revolt against romantic beauty and sensuousness of sound, and developed a style remarkable for its discordance, lack of conventional form, and ruthless severity.

SCHOOLS. Apart from their definitely educational purpose, one of the reasons for the provision of schools is that the younger generation may learn from hearsay all that its fathers have gained by slow experience, and hence will be fitted early in life to carry on the struggle for the advance of civilization.

The link between religion and education was forged at a very early date, possibly because it was only the priests, who were supported by the people by reason of their office, who were not too absorbed in the struggle for sustenance not to have leisure for abstract thought. Moreover, as the earliest civilized people had a profound consciousness that every happening was due to the agency of some spirit or god, they naturally looked to the priest for information, as how to please the god and interpret his wishes. We cannot assume that the priests were anything but sincere in the main, and they speculated on the gods, their nature and desires, on their connection with the world and the stars (hence astronomy). They also built temples to them which displayed the architectural and engineering skill of the people at its highest. The learning of the priests is shown in many other aspects in the writings which have come down to us. All that these priests knew was taught to the neophytes or clerical students. We know from the Bible that this was so among the Jews, and there have been found in Egypt many of the tablets used by the students when copying exercises.

In Greece at the time of the early city-states there arose by the side of the temple schools various academies for teaching letters, but apart from the fact of the existence of such schools we know little about them. They were organized by the state and were for children, and so have no connection with the schools which arose around certain thinkers such as Thales (640-550 B.C.), Pythagoras (c. 570-500 B.C.), Xenophanes of Colophon (570-480 B.C.), Democritus (460-361 B.C.), Socrates (467-399 B.C.), Plato (427-347 B.C.), Aristotle (384-322 B.C.), Epicurus (342-270 B.C.). These schools were rather universities, for the fame of the teacher drew scholars and students from the known world. Such teachers were concerned with philosophy in all its known branches,



ENGLISH PUBLIC SCHOOLS

1. Stowe School, a modern public school founded in 1923; the building was formerly the seat of the Dukes of Buckingham and Chandos. 2. Felsted School, founded in 1564 by Richard Lord Rich; it was reconstituted in 1852. 3. Stonyhurst College, Lancs. Founded in 1592 at St. Omers for the sons of English Catholics who suffered under penal laws, it was forced by political events to move to Bruges in 1762, and to Liège in 1773. In 1794 it was removed to England. 4. Eastbourne College, founded in 1867 by the Duke of Devonshire.

government, rhetoric and law. It is legitimate to assume that the students in turn returned to their homes and founded schools of lesser importance. It may be said that as far as the learned professions were concerned there were no organized schools, but students attached themselves to some distinguished practitioner and in his service gained the knowledge they sought.

In ancient Rome, learning does not appear to have been held much in esteem and clerical work was done mainly by slaves. Only those studied letters who were inclined to do so, or who were destined for a government or other position where it was necessary. After the conquest of Greece the Greek method was introduced, but philosophy had less prominence than rhetoric, law, and other knowledge of a practical bias.

Christianity brought with it the regeneration of religious speculation coupled with philosophy, but letters also had a place in the new curriculum of higher studies which was worked out for the benefit of those entering the clerical state. The young were also taught and gained their ability to read and write, as it were, through the medium of religious instruction.

Slowly, as the church grew, education developed. Owing to the determination of the Popes and the later emperors of the West, Charlemagne and his successors, schools arose around monasteries and cathedrals for the education of children. In England, King's School, Canterbury, was once attached to the monastery; Winchester, too, had a school even before the present college was founded by William of Wykeham. Other schools in England arose from the charity of private donors. Many of the Grammar Schools in England were founded by some rich merchant or noble, whose endowment was often augmented by later benefactions. The guilds, too, founded schools for the children of their members, and King Henry VI himself was the founder of Eton.

The Reformation saw the suppression of many English schools, for if they were connected with monasteries or chantries they suffered the same fate. Some were spared and to many of these was given the name of Edward VI, who so gained the reputation of being a patron of education since his ministers only half killed it. Elizabeth refounded a few of the suppressed schools, but little more was done for education until the nineteenth century.

Possibly one of the greatest changes in education brought about within modern times was the provision of schools for infant teaching, with a special curriculum and method adapted to the infant mind. To

Germany and Italy belongs the honour for the pioneer work in this direction through the achievements of great teachers like Froebel and Madame Montessori.

For modern educational methods, see EDUCATION. See also FROEBEL; KINDERGARTEN; MONTESSORI METHOD; UNIVERSITY, etc. **SCHOONER**, *shoon' er*. See YACHT AND YACHTING.

SCHOPENHAUER, *sho' pen hou er*, ARTHUR (1788-1860). German philosopher born in Danzig. In 1809 he began the study of medicine at Göttingen University, but abandoned it for the pursuit of philosophy; in 1813 he graduated from the University of Jena. Between 1814 and 1818, he made Dresden his home, writing at this time his most important work, *The World as Will and Idea*. Later, he lectured in Berlin in opposition to Hegel, but met with less recognition.

To him, the world was merely an idea of the mind, therefore nothing in itself; art he believed to be the only knowledge not subject to the will and the practical needs of life. Otherwise, he believed that the only "necessary reality in the universe is will; by will, he meant that blind impulse to act which is the common denominator of the sensual life of all animate beings. As reason is the motive power of thought so will is the motive power of action. Man living a normal life can never be a rational creature since he is always the slave of will. To secure happiness, one must restrain all desires.

SCHORL, *shorl*. A dark-coloured rock composed of aggregates of black tourmaline crystals with quartz and sometimes also white mica, topaz, feldspar and tinstone. It is found in veins in granites and is often associated with tin-bearing veins.

SCHUBERT, *shu' bert*, FRANZ PETER (1797-1828). German composer whose fresh and lovely songs have always endeared him to the world, but whose instrumental works have only recently been properly appreciated. Always melodious and polished, Schubert displays an unsuspected strength and directness in much of his bigger music. His symphonies, especially that in *C major*, and the ever-popular *Unfinished Symphony*, his



SCHOPENHAUER
Photo: Brown Bros.

quartets, especially that in *G major* (Opus 161), the superb *Quartet-Satz in C minor*, and his piano sonatas, especially the posthumous *B flat* sonata, combine with his

inimitable gift of song to place him very high as a serious and purposeful composer.

Schubert was born at Vienna of a musical family. He began to compose before he was 14, and his famous *Erlking* and *Wanderer* were created when he was only 19. Schubert was long hampered by poverty and lack of public recognition of his genius. His death, when he was but 31, was the result of over-



SCHUBERT
Photo: Brown Bros.

work and a bitter struggle with poverty and disappointment.

SCHUMANN, *shu' man*, ROBERT (1810-1856). A German musician of the romantic school. Of an astounding brilliance, his music is sometimes too grandiloquent but often reaches greatness.

Schumann was born at Zwickau, Saxony; his mother wished him to become a lawyer, but he was early devoted to music. At Leipzig he became the pupil of Friedrich Wieck, whose daughter Clara, herself a skilful pianist, became his wife in 1840. Under Wieck's instruction, Schumann made rapid progress, but his career as a pianist was cut short by an injury to one of his fingers. He had determined, however, to abandon the profession of law, and at the age of 21,



SCHUMANN

took up definitely his work as composer and musical critic.

In 1834 he joined with several other young enthusiasts in founding a journal (*Neue Zeitschrift für Musik*) for the encouragement of high ideals in music. Through this periodical, Schumann called the attention of the

public to the genius of Chopin, and gave loyal support to such rising musicians as Mendelssohn and Berlioz. The six-year period between 1834 and his marriage to Clara Wieck gave to the world his first symphony and some of his finest songs. Between 1840 and 1844, when he removed to Dresden, he composed the beautiful cantata *Paradise and the Peri*, and a famous quintet for the piano, and in the latter year he began his composition of the music for Goethe's *Faust*. In 1850 the Schumanns removed to Düsseldorf: here the composer's mind and health broke down.

SCHUSCHNIGG, *shoosh' nig*, KURT VON (b. 1896). Chancellor of Austria. A Catholic from the Tyrol and a *protégé* of Dr. Dollfuss, Kurt von Schuschnigg, although trained as a lawyer, has probably a deeper understanding of the needs and aspirations of the people of Austria, apart from the Viennese, than any other statesman.

During the War he saw active service and was more than once wounded. After the Treaty of St. Germain he became a lawyer and interested himself in politics, becoming a member of the Christian Socialist party. During his service with the party he attracted the notice of Dr. Dollfuss, the extremely able Minister of Agriculture, who later, when he became Chancellor, appointed von Schuschnigg Minister for Education, and second in command of the Fatherland Front, the private army of the party. On the assassination of Dr. Dollfuss, Kurt von Schuschnigg was appointed as his successor and immediately had to suppress the Nazi rising. His strong-handed measures in this direction and the success he won in uniting discordant elements earned him the disfavour of Berlin, which had some hope of an evolution of sentiment towards union, a hope which grew less as the economic situation of Austria rapidly improved. Germany's recognition of this led to an understanding which made Nazi propaganda from within innocuous. The Chancellor then forced the disarmament of the Fascists' private army and the resignation of its leader Prince Ernst Starhemberg.

Kurt von Schuschnigg is not antagonistic toward the re-establishment of the monarchy, but he now appears determined only to favour restoration upon very stringent conditions, since he is no longer so much in need of the support of the monarchists.

SCHWARTZ, *shvarts*, BERTHOLD. See GUNPOWDER.

SCHWERIN, *shvair' in*. See MFCKLENBURG-SCHWERIN.

SCIATICA, *si'at' ik a*. See NEURALGIA.

SCILLY ISLES. A group of small low-lying islands and reefs some 20 to 30 miles

west-south-west of Land's End, Cornwall. There are 48 islands spread over a space of 47 sq. miles, but the land area is only some 6 to 7 sq. miles. All the islands are built of granite and the greatest height is only 169 ft. above sea level. Only five of the islands are inhabited: St. Mary's, on which is the capital and only town, Hugh Town; St. Agnes, St. Martins, Tresco and Bryher. Round Island has a lighthouse but no other dwellings. The roadsteads between the chief islands give good anchorage. The total population is 1731 (1931). The temperature is equable; the climate is mild and wet. Snow and frost are almost unknown, sub-tropical plants can be grown out of doors. Fishing and a little cultivation used



PICKING NARCISSE AT TRENOWETH, ST. MARY'S
Photo: Fox

to support the inhabitants, but in recent years the growing of early flowers, tomatoes and broccoli are the chief interests. The chief flower harvest is in December to February. Communications are by steamer with Penzance.

Ancient tumuli show that the Scillies were inhabited in early times. Athelstan conquered the islands in 938 and established a monastery on Tresco. Henry I made them subordinate to the Abbot of Tavistock. In 1568 Elizabeth leased the islands to the Godolphin family, for 250 years. In 1834 the Dorrien-Smith family obtained a lease and held it until 1926, when the Crown resumed possession.

SCIMITAR, *sim' it er*. See **SWORD**.

SCIPIO, *skip' so or sip'*. The name of an aristocratic Roman family, two members of which achieved distinction.

Publius Cornelius Scipio (237 B.C.—185 B.C.), called **AFRICANUS MAJOR**. Sometimes regarded as the greatest Roman general before Julius Caesar. In 205 B.C. he was elected to the consulship, and a year later invaded Africa with a large army. At Zama, in the year 202, he inflicted a decisive defeat on the Carthaginians, and brought the war to a close. Scipio returned to Rome a

popular hero, was accorded a triumph, and received the surname *Africanus*. Toward the close of his life, Scipio became involved in a political conspiracy, but on the day set for trial, he delivered an eloquent speech in which he reminded the people of the victory at Zama, of which that day was the anniversary. This stopped further proceedings against him.

Publius Cornelius Scipio Aemilianus (185 B.C.—129 B.C.), called **AFRICANUS MINOR** (the Younger), was a grandson of the elder Scipio by adoption. During the siege of Carthage, the surrender of which ended the Third Punic War, he was elected to the consulship and given supreme command of the army in Africa. On the fall of the city in 146 B.C., he returned to Rome, where he later held the office of censor. In 134 B.C., having been re-elected consul, he reduced the city of Numantia in Spain, after vain attempts by several other consuls.

SCLERA, *skle' ra*. See **EYE**.

SCLEROMETER, *skle rom' e ter*. See **HARDNESS**.

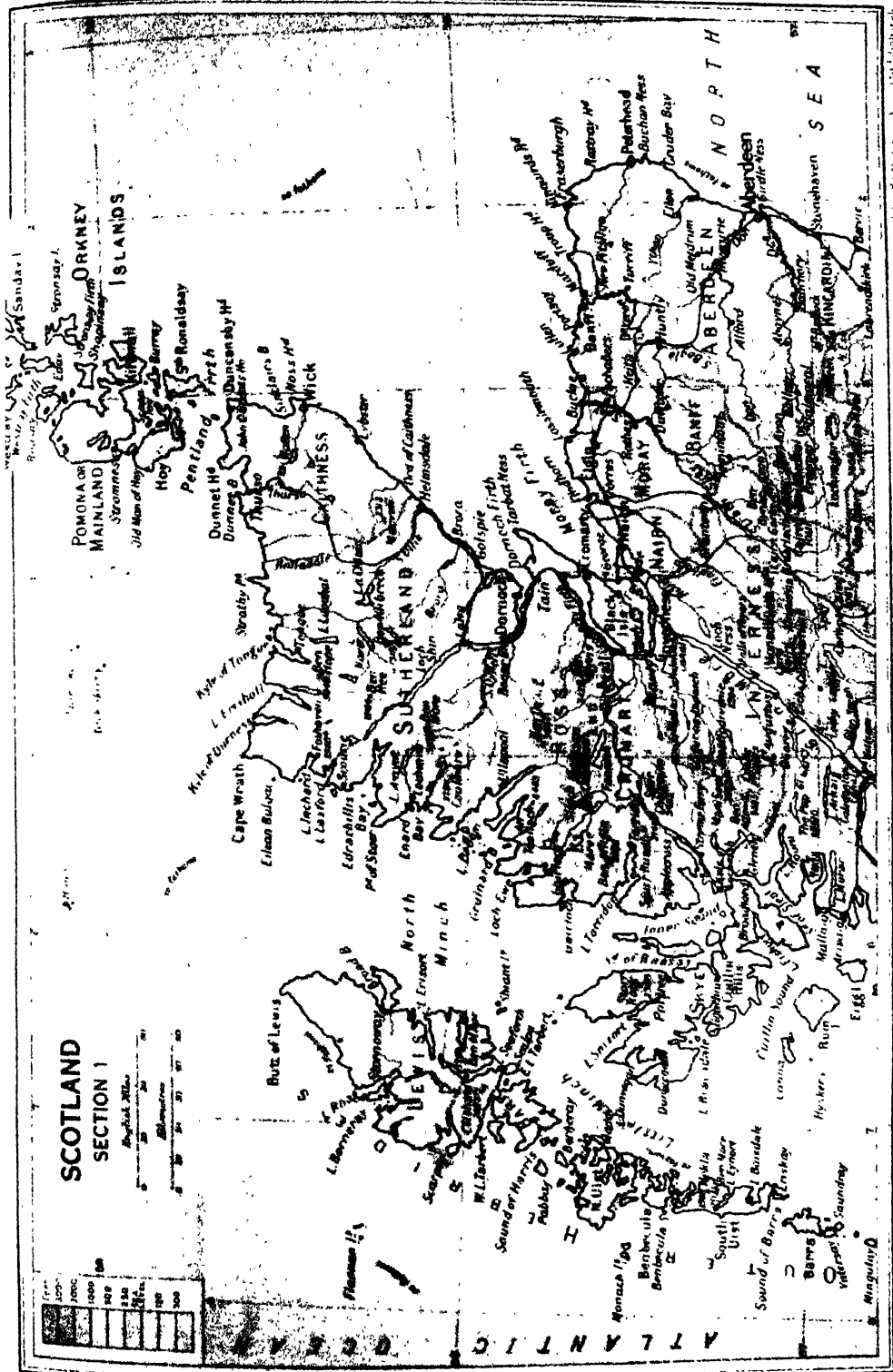
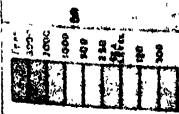
SCORIAE, *skor' re ay*. Light, cellular, cinder-like masses of rock ejected from volcanoes.

SCORPIO, **THE SCORPION**. The eighth sign of the zodiac, whose symbol is ♏ (see **ZODIAC**). The constellation Scorpio appears in the southern part of the sky. It contains the bright star Antares, the largest star known, which shines with a fiery-red light. This first-magnitude star has a companion of seventh magnitude, which is greenish. According to Greek mythology, the scorpion killed Orion, when the latter boasted that he would kill every poisonous reptile on earth. Artemis sent the scorpion to sting him, and he died. The scorpion also frightened the horses of the sun when Phaëthon, the son of Apollo, drove them. See **ANTARES**.

SCORPION. An insect belonging to the same class as spiders, mites, and ticks, or the arachnids (see **ARACHNIDA**), found in warm countries in most parts of the world. The scorpion's sting is dealt from a curved organ on the last segment of the tail. Two glands at the base of the segment secrete a poisonous fluid that flows out of two pores, and the wound inflicted is exceedingly painful, though not usually fatal.

The body of a scorpion consists of two divisions—a short, forward part, made up of the head and thorax, which are united, and a long abdomen, the last five segments of which form a slender tail. On the front end of the body, called the *cephalothorax*, there are two pairs of appendages bearing pincers, and four pairs of legs; the pincers of the second pair of appendages resemble the claws of a lobster. The number of eyes

SCOTLAND SECTION 1





varies in different species from six to twelve. On the abdomen are found the breathing

pores. All scorpions produce their young alive, the eggs hatching in the mother's body. Scorpions feed on insects and spiders, and are chiefly active at night. They are usually black or yellowish in colour, and range in length from $\frac{1}{4}$ in. to 8 in.

SCORPION FLY. The common name of certain insects in the order *Mecoptera*; the name means "long-winged." The scorpion flies are $\frac{1}{4}$ in. or more in length, and have two pairs of netted wings as long as the body. They are not true flies, all



SCORPION

Photo: Photopress

of which belong to the order *Diptera* (two-winged). The body of the male scorpion fly ends in two slender, pincer-like appendages, whence the name. These pincers can be used as forceps for clasp- ing objects.

SCOTER, *sko' ter*. A small distinct group of ducks which are almost exclusively marine in their habits. They are distinguished by a swelling at the base of the bill, which is best developed in adult males.

Three species are found in Britain, the common scoter (*Oidemia nigra*), the velvet scoter (*O. fusca*), and the surfscoter (*O. perspicillata*).

SCOTLAND. The northern part of the island of Britain, together with a number of outlying islands including the Shetlands, the Orkneys, the Hebrides, and Skye. Politically it is part of the United Kingdom. The country was called Caledonia by the Romans and received the name of Scotland

from the Scots who invaded it from Ireland. No well marked boundary separates Scotland from England except in the east where the Tweed forms the frontier, although Berwick, on the northern side, is now in England. The total area of Scotland is 30,405 square miles, of which 606 square miles are water.

People, Language, and Literature. The population in 1931 of 4,842,980 showed a decrease of about 40,000 compared with the census of 1921. The population is very unevenly distributed and extremely sparse in the Highlands, which have shown a steady decrease during the last century. Almost the entire population is Scottish born, only 7 per cent being of English and Irish birth, and less than 1 per cent of foreign birth. Over three-quarters of the population are urban dwellers. Emigration to Canada, the United States and New Zealand has been steady during the last hundred years.

Scotland is the stronghold of Presbyterianism, and most of the people belong to the United Church of Scotland, founded in 1929 by the union of the Church of Scotland and the United Free Church. There are also Episcopal and Roman Catholic churches and some independent Presbyterian sects who refused the union.

In racial origin the Scots differ little from the English. They are a mixed people of Nordic, Alpine and Mediterranean type. The differences between Highlander and Lowlander, which used to exhibit themselves in a certain degree of antagonism, are due to environment, tradition, language and religion rather than to race.

Until the fifteenth century a distinct Gaelic tongue was spoken in the Highlands and



TEMPTING THE SCORPION

The Arab on whose hand it is seen has become immune to the sting.

Photo: Cherry Kearton

parts of the south-west, but it has gradually decreased in use, and nowadays few if any people even in the remotest districts do not know English, though many understand Gaelic.

The kilts which were once the usual dress of the Highlanders and of some lowland clans are now less often used, except for ceremonial and military purposes.

Until the eighteenth century, Scotland had a distinct national literature. The ballads and songs of the bards, the romance of *Sir Tristram* by Thomas the Rhymer, the tales of *The Bruce* by Barbour, and stories of

may be provided for the children. Unlike England, Scotland has never had many private and endowed schools.

The growth of technical education in recent years has been remarkable. The Royal Technical College at Glasgow is among the most important in the world.

The four universities have an attendance which is larger in proportion to the whole population than that of England with its eleven universities. Women are admitted on the same conditions as men, and university education costs much less than in England. The universities, as in England and Wales,



THE BRAEMAR GAMES

Photo: Fox

the deeds of Wallace by "Blind Harry," exerted a great and lasting influence on the work of the later poets of both Scotland and England. James I, Henryson, Dunbar, Douglas, and Lyndsay are prominent Scottish poets of the fifteenth and sixteenth centuries. Most later writers of Scottish birth, including Robert Burns, Sir Walter Scott, James Hogg, Joanna Bailie, George Macdonald, Robert Louis Stevenson, John Watson (Ian Maclaren), and Sir James Barrie, are discussed in the history of English literature or in separate articles.

Education. Scotland surpasses all other parts of the United Kingdom in the excellence of its elementary and secondary education. The many religious and civil struggles of the country did not prevent the early provision for public instruction. In 1872 the Scottish Education Department was created, and Boards having charge of elementary and secondary schools were elected in every burgh and parish. This system of parochial and burgh schools was superseded in 1918 by government provision; even food and books

are aided by government grants, and by the annual income from a £2,000,000 trust fund, the gift of Andrew Carnegie. The prominent universities are St. Andrews, with a college at Dundee, founded in 1411; Glasgow, 1450; Aberdeen, 1494; and Edinburgh, 1582. The National Library of Scotland, which grew out of the Advocates Library, was instituted in 1925.

Physical Features. There are three divisions of unequal size and importance, the Highlands, the Central Lowlands and the Southern Uplands. The Highlands are a rugged plateau of ancient crystalline rocks forming one of the earliest features of Great Britain. Water and ice erosion have carved deep and often wide valleys or glens between which rise ridges and heights averaging 3000 ft. The greatest heights are Ben Nevis (4406 ft.), the highest elevation in the British Isles, Ben Macdhui (4296 ft.), Cairn Toul (4241 ft.), and Cairn Gorm (4085 ft.). Across the highland region runs the fault valley of Glenmore; south and east of this are the Grampians. The western coast has



SCOTTISH SCENERY

Strathmore, between Perth and Blairgowrie. 2. Valley in the Cheviots, near Kirk Yetholm. 3. Mull of Galloway. 4. Mountains of Sutherland, near Lochinver, in the background are seen the peaks of Canisp and Suilven. 5. Loch Lomond at Rowardennan, with Ben Lomond in the background.

Photos: Taylor

been submerged and is deeply cut by long fjords or sea lochs and fringed with many islands. The eastern coast is more low-lying and regular and, with a belt of sandstone widening in the north into the plain of Caithness, gives greater fertility than the rugged interior with its poor and scanty soil. Many deep lochs lie in the highland valleys, and rivers of steep gradient are characteristic. Population is scanty and unevenly spread. The Central Lowlands or Midland Valley represents an area let down by faulting and crumpled in the process, so that it shows minor ranges of hills and many wide areas of plain. Drowning by the sea has resulted in great estuaries known as firths (Tay, Forth, Clydesdale), which nearly cut Scotland into two parts. The low level, fertile soils and abundance of coal have made this the most populated area of Scotland. The Southern Uplands are another worn and glaciated plateau, but not so old as the Highlands. Their heights are rounded and less striking, and rise to less than 3000 ft.

The whole of Scotland was covered by ice during the Ice Age. The centres from which the ice sheets radiated were the Northern and Central Highlands and the Southern Uplands. The result was the removal of much soil from the higher ground, the rounding and smoothing of contours, and the deposition of moraine matter in valleys.

Rivers and Lochs. The Clyde, flowing west to the Atlantic, is the most important river since it flows through the largest coalfield, but, as in other Scottish rivers, only its estuary is navigable, but ceaseless dredging enables large vessels to reach Glasgow. The Forth and the Tay have wide estuaries. The border river of Tweed and its tributaries flow through a fertile region in the south. The Highland rivers, like the Dee, are rapid and often torrential, and their use for water power has been suggested.

Scotland is noted for its many lochs which are largely the result of glacial action in damming valleys by moraines and in scooping out rock basins. The largest are Loch Lomond, Loch Ness (900 ft. deep) and Loch Awe. The Lake of Mentieth is the only "lake" in Scotland.

Climate, Flora and Fauna. Scotland is exposed to prevailing westerly winds and their associated cyclones. Its climate is thus on the whole mild and wet and certainly warmer in winter than its latitude would suggest, though low temperatures are often experienced in the Highlands where snow lies on the heights throughout the winter. There is no permanent snowfield. On the east, winds are cooler than on the west, but not colder than in eastern England. In summer the temperatures are lower than in

England. It must be remembered, however, that winter daylight is very short in Scotland. Rainfall reaches 100 in. or more on Highland summits. The west coast has 40 to 60 in. a year, but the east 30 to 40 in.

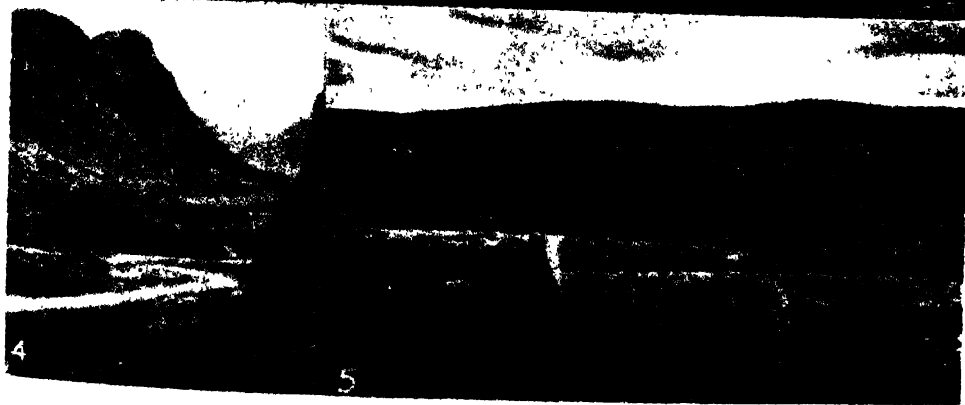
Forests were once of much greater extent than to-day, when they cover small but increasing areas in the Highlands. Moor of peat and heather with grass at lower levels is characteristic of the Highlands where, however, oats and root crops grow better in the valleys than the meagre cultivation would suggest. Much of the hill country is reserved for grouse and deer. The grass, typical of the Southern Uplands and low hills of the Central Lowlands carries many sheep. Cultivation of cereals, root crops and pasture grasses is the feature of the lowland areas, both in the centre of the country and along the eastern side.

Of wild animals peculiar to Scotland only a few remain: the golden eagle and the wild cat are very rare; the red deer is carefully preserved; the mountain hare survives and the capercaillie has been reintroduced and thrives. The red grouse is native.

Agriculture. About one-sixth of the total area is arable land, one-twelfth is permanent pasture, and about one-half is rough grazing land. The remainder is unproductive. Most of the arable and pasture land is held by tenants in farms of under 50 acres. Recent legislation tends to increase the number of small holdings and break up the large estates. In the Highlands many crofters, as smallholders are called, have less than 5 acres each. Of cereals oats are by far the most important and widespread, and oatmeal was and to a less extent is a national food. Wheat does well only in the east, chiefly in Midlothian. Swedes, turnips and potatoes are extensively grown. Market gardening is active and small fruits are grown on Tay side (Carse of Gowrie). Flax used to be grown on the east and in Fife. Dairy cattle are noted in Ayrshire and the south west, and beef cattle in Aberdeenshire. Several breeds of cattle, Ayrshire, Galloway and Polled Angus are famous, as are Clydesdale horses and Shetland ponies.

Fisheries. Proximity to the sea and scantiness of resources have made fishing important. Almost every haven has its fishing village, but the displacement of sail by steam has concentrated large-scale fishing at a few ports, of which the chief are Aberdeen, Stornoway, Kirkwall, Wick, Fraserburgh and Leith. Herring and whitefish are the catches. Salmon fishing is also of value. Whaling has now almost ceased.

Minerals. The abundant coal and iron resources of the Central Lowlands have profoundly affected the economic life of



SCENES FAMOUS IN SCOTTISH HISTORY

1 Pass of Killiecrankie, site of the battle of 1689. 2 The Abbey of Kelso, founded by David I in the twelfth century, the burial-place of his son Henry. 3 Balmoral Castle, Scottish residence of H M the King. 4 Looking down the Pass of Glencoe, where the massacre of the MacDonalds for delay in swearing allegiance to William III took place in 1692. 5. Culloden Moor, scene of the battle that broke the Jacobite rising of 1745.

Scotland. Coalfields occur in Ayrshire, Lanark, Fife, and Midlothian, that of Lanark being the largest and having the best coal. The total annual output is about 28,000,000 tons. A large quantity of the Fifeshire coal is exported to Northern Europe. Iron ore is associated with coal on the Ayrshire and Lanarkshire fields. Oil shale is dug in Midlothian and Linlithgow and lead in Lanarkshire. Granite is quarried around Aberdeen and Peterhead. Peat is exclusively used for fuel in the Highlands.

Manufactures. In the nineteenth century, Scotland's industrial interests superseded agricultural activities, and over one-fourth of the population is now engaged in manufacturing and in the coal and iron industries. The iron production and maritime advantages of the country have developed the largest shipyards of the world along the Firth of Clyde.

Glasgow is also the centre of the large iron and steel industry and marine engineering and locomotives. Scotland produces about one-seventh of the pig iron of the United Kingdom. Glasgow has important chemical industries, and the manufacture of paper, glass, gloves, and hosiery is also carried on. Whisky distilleries are widely scattered throughout the country.

As in England, the textile industry shows a slight decline, but it is still one of the chief manufacturing industries. Scottish yarns and woollens, especially those manufactured in the district of the Tweed, are famous. Linens and cottons are also extensively manufactured, the latter especially in the vicinity of Glasgow, and lace-weaving and the manufacture of silk are increasing in importance. Some domestic woollen manufacture persists in the Highlands and islands.

Transport and Commerce. There are about 4,000 miles of railways in Scotland. The improvement of Scottish highways has been regulated by law since the twelfth century, and the roads are kept in repair by annual government grants. Motor transport of both passenger and freight has become extensive.

Canals include the Caledonian Canal, extending navigation across the country in the north-central section; the Forth and Clyde Canal, opening a waterway from sea to sea, and passing Glasgow; the Union Canal; and the Crinan Canal. Leith, Dundee, Grangemouth, and Aberdeen are the large ports of the east coast, and Glasgow, Greenock, and Kilmarnock are the important commercial ports of the Firth of Clyde, on the west. An air service operates between Glasgow and London, and there is connection with Ireland as well as branch services.

Early Inhabitants. At the time of the Roman invasion of the British Isles, A.D.

78-82, Caledonia, or that region north of the Rivers Forth and Clyde, was occupied by a composite race, descendants of the Celtic invaders and earlier non-Nordic people, the original inhabitants of the country. These Caledonians were later called Picts, and were the ruling people of North Britain when it was invaded by the Scots from Ireland. The Britons overran the south and Lowland regions, and Scotland's early history is a story of the continual warfare between the Picts of the Northern Highlands, the Scots, and the heathen Teutonic invaders. The Scots were Christians before their invasion of Caledonia, and the Picts were converted by Saint Columba, the Celtic missionary from Ireland.

Establishment of the Kingdom of Scotland. In the ninth century, the Picts and Scots were united under Kenneth MacAlpin, king of the Scots, and a hundred years later the kingdom became known as Scotland. In the eleventh century, the country was often occupied in wars with the Norwegians, who had settled in the Orkney and Shetland Islands, and with the English in the Scottish Revolts and intrigues against the king were frequent among the *mormaors*, the rulers of the various Scottish provinces, and the *toisechs*, or tribal chieftains.

The purely Celtic monarchy ended with the accession of Malcolm Canmore (1059-1093), after the death of Macbeth. Malcolm strengthened the growing English influence in Scotland by his support of the English king against the Norman invaders and the introduction of English settlers and feudal ways into Scotland.

The feudal system in church and state spread over Scotland in the twelfth century. David I (1124-1153), called the "Maker of Scotland," reformed justice, established towns and bishoprics, replaced Scottish lords and churchmen by English and Norman nobles, and acquired Northumberland by conquest. In 1175 the Scottish king, William the Lion, was captured in an invasion of England, and for the next fourteen years Scotland was a feudal dependency of England. William's son, Alexander II, renounced his claim to the north-eastern provinces of England for a yearly payment of about £200, but his successor, Alexander III, recovered the western islands from the Norwegians by treaty in 1266.

The Struggle for Independence (1280-1328). Although the English kings claimed an overlordship over Scottish rulers, the latter, except William the Lion, paid homage for their English possessions only. After the death of Alexander III, there were thirteen claimants to the throne, and Edward I of England claimed the right as overlord to

A few of many
**SCOTTISH
TARTANS**



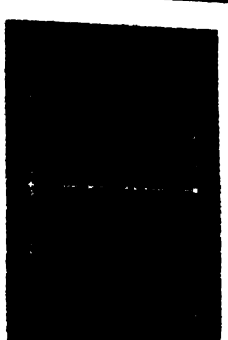
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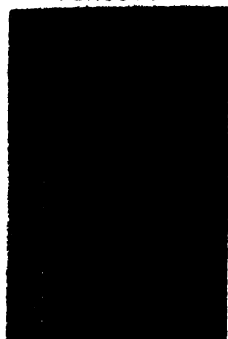
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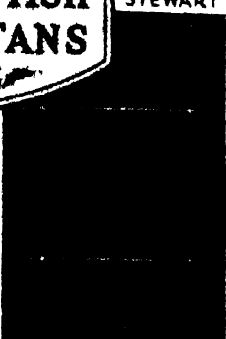
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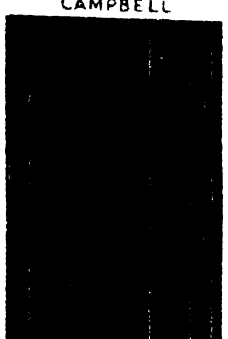
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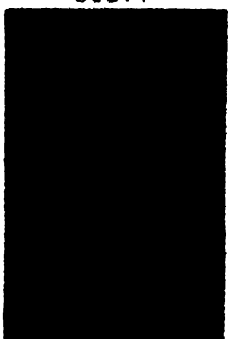
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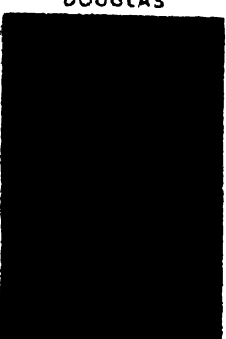
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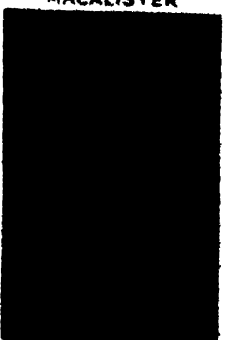
MACFARLANE



LOGAN



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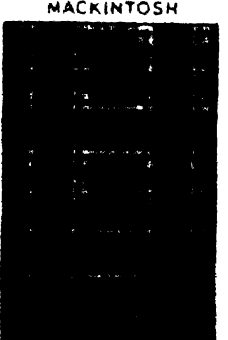
MACDONALD



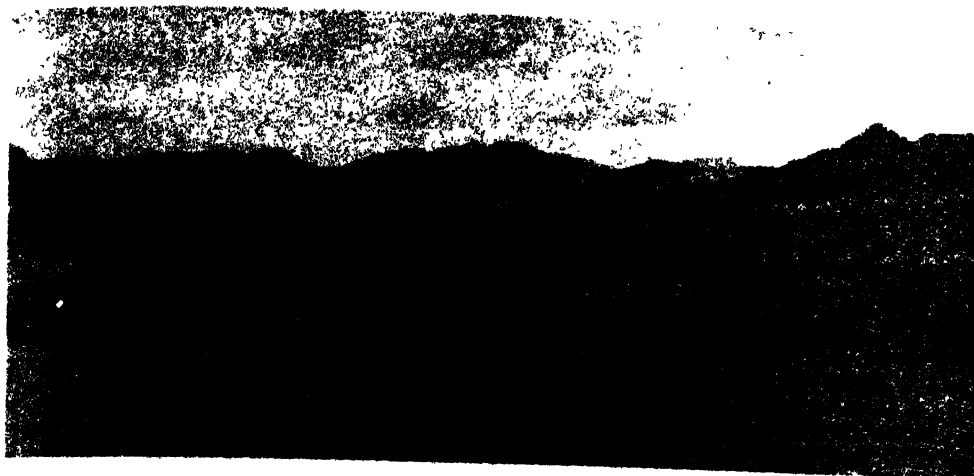
SINCLAIR



CAMERON



MACBETH



*Top: On the Aberfoyle-Trossachs Road. Centre: Loch Achray and the Trossachs Hotel
Bottom: The Teith at Callender.*

Photos: Scottish Travel Association, L.M.S.

appoint the successor. The Scottish nobles revolted against his choice of John Baliol, and formed an alliance with France. Edward then invaded Scotland, and as a result of his victory at the Battle of Dunbar, declared himself king. The native Scots rallied under William Wallace, a popular hero of Scottish history, and defeated the English forces at Stirling. The long and cruel wars of independence which followed ended in the victory of the Scots under Robert Bruce in the famous Battle of Bannockburn in 1314.

Power of the Nobility. Bruce was crowned king, but the struggles with rival claimants to the throne were not ended. During the reign of his son, the child king, David II (1329-1371), a descendant of John Baliol, supported by Edward III of England, claimed the throne. Added to the perpetual warfare on the English border were the feuds between the powerful clans and the long struggle between the house of Douglas and the Crown. During the reigns of David and his successors, Robert II and Robert III, the powerful nobles were virtual rulers.

Order was restored by James I (1406-1437) but during the succeeding reigns of James II and James III, history repeated itself in the renewal of feud, murder, and anarchy. James IV, through his alliance with France, then at war with England, invaded Northumberland, and was defeated and killed at Flodden Field in 1513. James V and his daughter, Mary Queen of Scots, continued the alliance with France. During most of Mary's reign, the court of Scotland was the centre of plot and intrigue.

Religious Struggles. The religious Reformation in England spread to Scotland, reaching its height in 1559 and 1560, under the leadership of John Knox. In 1560 a Reform Party Parliament assembled and established the democratic Presbyterian Church.

The religious struggles and plots of intriguing ministers continued during the reign of Mary's son, James VI. In 1603 he left Scotland to become James I of England, and from this time onward Scottish history is closely related to that of England. Both James and his unfortunate son, Charles I, attempted to draw the two countries into closer union and to establish the Church of England in Scotland.

In the Civil War in England, 1642-1649, when Cromwell's Parliament Party defeated the Royalists and executed Charles I, the Covenanters took the part of Parliament. At Dunbar, 3rd September, 1650, Cromwell defeated Leslie, the victor at Philiphaugh. After the Restoration in 1660, Charles II attempted to re-establish Episcopacy in

Scotland, and the strict Covenanters were cruelly persecuted. They joined the English Revolution of 1688, and proclaimed William and Mary as their sovereigns. After Claverhouse's death in battle at Killiecrankie (1689) Jacobitism declined. Religious freedom was restored, but during the following reign of Queen Anne, the ill feeling between Scotland and England increased, and England saw that a union was necessary to preserve peace.

Union with England. Not without violent opposition in the Scottish Parliament, the Articles of Union were passed in January, 1707, and the two kingdoms were united under the name of Great Britain. It was provided that the Presbyterian Church of Scotland be maintained; that sixteen Scottish lords and forty-five members of the House of Commons be elected to the Parliament at London; that all rights of trade and citizenship be the same for Scottish and English subjects; and that Scottish property, laws, customs, and private rights should remain unchanged. The suppression of the Jacobite risings of 1715 and 1745 (the latter at Culloden, the last battle fought on British soil) completed the work begun by the union men, and Scotland passed at once from a long period of petty feudal warfare to the peace and order which characterized England. The country has never made any aggressive attempt to re-establish House Rule. However, in recent years there has been a revival of national feeling which has been reflected in the renewed interest in Scottish customs, language, and literature.

Government. Scotland is represented in the British Parliament by sixteen of its peers in the House of Lords, and seven or four members in the House of Commons. Of the latter, the counties elect thirty-eight members, the burghs thirty-three, and the universities three. The administrative department for purely Scottish affairs is the Scottish Office. Its head is the Secretary of State for Scotland, a member of the Cabinet, who is assisted by the Lord Advocate and the Solicitor-General for Scotland, both members of the government, but not in the Cabinet. Other Scottish departments are the Scottish Board of Health, the General Board of Control (formerly the Board of Lunacy), the Scottish Education Department, the Board of Agriculture, and the Fishery Board. The Scottish Office and the Education Department are in London; the other departments have offices in Edinburgh. It is intended later to house all departments in the building planned in Edinburgh. Under the terms of the Local Government (Scotland) Act of 1929, local affairs are managed by county councils and town

councils. The burghs, or towns, are classified as "large" or "small" burghs, the former being those with 20,000 population or more; and the small burghs are administered by the respective county councils. The town councils of large burghs, and the county councils, are now the local authorities for poor relief, public-health services, town planning, road maintenance, police, valuation, and lunacy-law administration. The education area is the county, as before, and statutory committees are appointed for police, poor relief, and education.

SCOTLAND, CHURCH OF. The established Church of Scotland is Presbyterian (see PRESBYTERIAN), and was founded under the influence of John Knox in 1560 by the Scottish Parliament assembled in Edinburgh; in 1592 an Act was passed guaranteeing its liberties and its Presbyterian government.

When the King James VI, who had always been in favour of Episcopacy, became King of England, he declared that Presbyterianism was opposed to the monarchical principle, and quashed the rights of the assembly, persecuting the leaders of the Scottish Church. This policy was carried further by Charles I, who imposed the English Liturgy on the Scottish congregations, but was compelled by their resistance eventually to give way and sign a treaty favourable to their demands.

During the period of the Commonwealth Scottish Presbyterianism flourished, but on the accession of Charles II there began a period of persecution of the Church. New bishops were consecrated from England, and the holders of Scottish benefices were required to acknowledge their authority and jurisdiction on pain of ejection from their livings. No less than 400 ministers were thus deprived. It was not until the revolution of 1688 and the accession of William III, that the Church of Scotland regained the privileges conferred upon it in 1592.

By the beginning of the nineteenth century, however, dissensions had arisen within the Church connected with doctrinal differences, and more particularly with the question of lay patronage. These led in 1843 to what is known as the Disruption, the secession from the main body of 451 of its ministers and about a third part of the lay members, who formed themselves into a body naming itself the Free Church of Scotland. It was not until 1929 that, by an Act of Union, this body was reunited with the Established Church under the title of The United Church of Scotland.

The system of Scottish Church government is largely elective. Each parish has its Kirk Session, consisting of the Minister and elders elected by the congregation. Above these Kirk sessions are the Presbyteries, the

twelve Provincial Synods, each consisting of a certain number of Presbyteries, and the highest Court, the General Assembly presided over by the Moderator. All these bodies are composed of both ministers and laymen.

The number of Scottish Church congregations is 2920 and the number of communicant members about 1,250,000.

SCOTLAND YARD. The original headquarters of the Criminal Investigation Department of the London Metropolitan police. Until 1890, the building was one which, from the tenth to the twelfth century, had lodged visiting Scottish kings and ambassadors.

In 1890 the metropolitan police, including this department, moved into an imposing group of buildings on the Thames Embankment. The new headquarters was christened New Scotland Yard.

SCOTT, ROBERT FALCON (1868-1912). A noted English explorer, who lost his life on the return journey from the South Pole. Robert Scott was born at Outlands, Devonport, and was educated at Stubbington House, Fareham. In 1882 he entered the Royal Navy, and had attained the rank of naval assistant to the second Sea Lord of the Admiralty by 1909, when he resigned.

Meanwhile, Scott had become absorbed in plans for Antarctic discovery, and between 1901 and 1904, had made one such expedition. Late in 1910, he sailed in the *Terra Nova* from New Zealand, with the hope of arriving at the Pole, and without incident reached Cape Evans on Ross Island, where he had determined to set up headquarters. During the summer of 1911, he established supply stations along his proposed route toward the Pole, and in October started with sledges over the ice. On 18th January, 1912, they reached the Pole, only to find that Amundsen had been before them in the discovery. Setting out on the return journey, the whole party of five died from privation and exposure, only a few miles from their nearest provision base.

The bodies, together with records and diaries the men had kept, were found in the tent which had been erected as their last camping-place.



CAPTAIN SCOTT
Photo. Brown Bros.

SCOTT, SIR WALTER (1771-1832). Scottish novelist and poet. He was the son of an Edinburgh lawyer. As a child he was both lame and delicate from an illness, contracted when he was less than two years old. Two years at the University of Edinburgh gave him no great reputation as a student, though he learnt French, Italian, and German, that he might read the romantic literature in those tongues. His father had determined that the son was to follow the legal profession, and in 1792 he was called to the bar. But he was no lover of the law, and in 1799, two years after his marriage to Charlotte Charpentier, accepted an appointment as Sheriff of Selkirkshire. Some years later his appointment as a clerk of the Court of Session made it possible for him to give up private practice and devote himself to literature.



SIR WALTER SCOTT
Photo: Brown Bros.

The first works which appeared under his name were translations, in 1796, from the German of Burger's *Lenore* and *The Wild Huntsman*, followed three years later by an English version of Goethe's

Götz von Berlichingen. Meanwhile, he had tried his hand at poetry, and produced the fine ballads of *Glenfinlas*, the *Eve of St. John*, and *Grey Brother*. For years he had been collecting Scottish border poetry, and the results of his work were published in 1802 and 1803 as *Minstrelsy of the Scottish Border*, which won him wide and favourable notice. In 1805 appeared his first original work of note—the long poem called *The Lay of the Last Minstrel*. Its popularity was immediate and great. *Marmion* followed, and was even more enthusiastically received. Scott was astonished at his success, which was repeated in 1810 on the publication of *The Lady of the Lake*, which drew crowds of tourists to the scenes it described.

In 1804 Scott removed from Lasswade to the banks of the Tweed, where, from year to year, he built up the magnificent castle of Abbotsford, which was the pride of the countryside. Not until 1824 was it finished.

Scott had felt that poetry was not for him the only possible mode of expression, and as early as 1805, started *Waverley*, which, however, he laid aside. As he began to realize that the poems which followed *The*

Lady of the Lake were diminishing rather than increasing his fame, he determined to return to the prose romance, strengthened in his purpose by the fact that Byron was surpassing him in his own field in poetry. In 1814 *Waverley* appeared anonymously, and the earlier success of the poetry was duplicated. The "Great Unknown" was discussed on all sides, and it was not until 1827 that Scott formally acknowledged the authorship. In incredibly rapid succession appeared the volumes in the long series of *Waverley Novels*, two often appearing in one year. The most noteworthy were *Guy Mannering*, *The Heart of Midlothian*, *The Bride of Lammermoor*, *Ivanhoe*, *Kentworth*, *Quentin Durward*, and *The Talisman*.

In 1820 Scott's fortune seemed certain. The sales of his books assured him perhaps £10,000 a year, but his good fortune did not last. Years before, he had become a silent partner in the printing firm of James Ballantyne & Company, and more than once he had been called upon to rescue it from misfortune. In 1826 the failure of the great publishing business of Constable & Company brought Scott's firm into bankruptcy. Scott's sense of honour caused him to assume the whole vast sum as a personal debt. The struggle that followed was heroic, and Scott's facility in composition stood him in good stead. *Woodstock*, *The Fair Maid of Perth*, *Anne of Geierstein*, a *Life of Napoleon* in nine volumes, four volumes of historical sketches known as *Tales of a Grandfather*, were but a part of what came from his pen between 1826 and 1831. His health broke under the strain, yet he was happy in his end for he believed that he had paid the debts. He was buried at Dryburgh Abbey. In 1847 all of his voluntarily assumed obligations were paid off by the sale of copyrights.

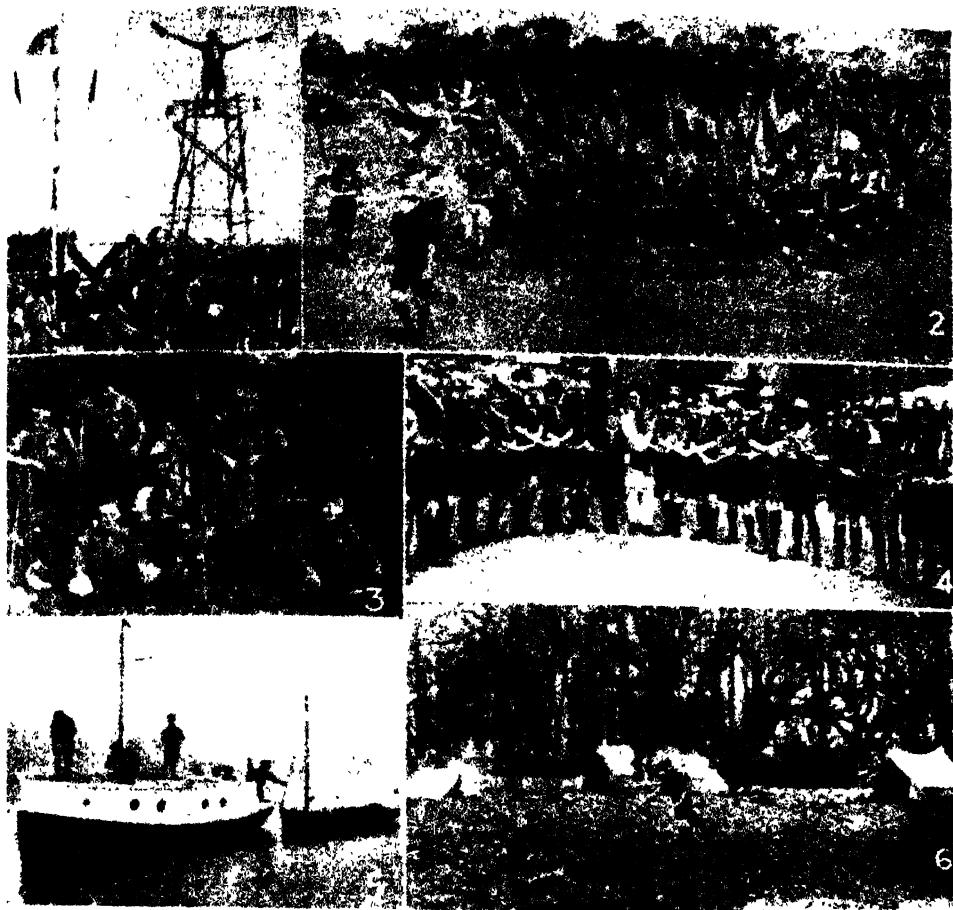
SCOTTISH OFFICE. The Department of the Secretary of State for Scotland, a title created in 1926. This minister is the successor of the Secretary for Scotland, an office created in 1885, to which were transferred matters relating to Scottish affairs which hitherto had been performed by the Home Office, the Local Government Board, the Treasury, and the Committee of the Privy Council for Education.

The Scottish Secretary, who is a Cabinet Minister, is also the Keeper of the Great Seal of Scotland. See **SCOTLAND**.

SCOTUS, *sko' tus*. See **DUNS SCOTUS**, **JOANNES**.

SCOURING RUSH. See **HORSETAIL**.

SCOUT MOVEMENT. The Boy Scout movement was conceived by Lord Baden-Powell of Gilwell in 1907 when he organized an experimental boy's camp, and the movement itself was inaugurated in the following



SCOUTS' ACTIVITIES

A signalling tower made from scout poles. 2. Colours from all parts of the world passing the saluting line at a world jamboree. 3. Handicapped scouts for whom special sections have been organized. 4. Scouts from all corners of the world. 5. Sea scouts at work. 6. Scout troop encampment.

Photos: Boy Scouts' Association, Fox, Tofuol, Central.

year. It spread with such rapidity that by 1910 there were over a quarter of a million scouts and the movement had gained a footing in many other countries (Chile being the first outside the mother country). In 1912 the movement was granted a royal charter of incorporation. The first jamboree (a general meeting of scouts of all nationalities) was held in London in 1920 and was attended by representatives from twenty-six nations. Jamborees are held about every four years. The largest to date was that of 1929 at Birkenhead. Over 50,000 scouts representing forty-eight countries attended. In 1935 there were in the world approximately 3,000,000 scouts, the figures for the United Kingdom being 558,396, and for the British Empire 939,203.

The object of the movement is to train and develop boys of all ages in character, intelligence, skill and self-care and to instil in them the principles of good citizenship. The scout is taught to love God, honour the king and to obey the scout law. He is encouraged to do a "good turn" daily. The movement is strictly non-military.

The scout grades are as follows. *Wolf Cubs* between the ages of 8 and 12; *Scouts* from 11 to 18; *Rover Scouts* from 17 upwards. In addition there are the *Sea Scouts* (from 12 upwards) and *Deep Sea Scouts* (men who have joined the Royal Navy or the Merchant Service and yet keep up scout activities). Scouting has also developed among boys who are crippled, deaf, dumb or blind. These are known as the *Handicapped Scouts*.

SCREES. The term used in geology for accumulations of angular rock fragments which are formed by the action of frost and atmospheric weathering of cliffs, crags and exposed steep slopes. The fragments slide or fall down to the base, where they accumulate and form talus slopes or screes.

SCREW. This familiar device is called a *simple machine*. The spiral projection on the surface of the cylinder is known as the *thread*, and the cylinder is called the *body*.



USES OF THE SCREW

1. Vice. 2. Jack-screw. 3. Micrometer screw.
4. Worm wheel

The vertical distance between two whorls of the thread is known as the *pitch*.

The mechanical advantage of the screw is stated thus—

With the screw, a given force will support a weight as many times as great as itself as the circumference described by the force is times as great as the pitch of the screw.

A complete revolution of the screw raises the weight a distance equal to the pitch. A screw having five threads to the inch has a pitch of one-fifth inch. See also **PROPELLER**.

SCRIABIN, *skre' ah bin*, ALEXANDER NIKOLAIEVITCH (1872-1915) Russian pianist and composer; studied at the Moscow Conservatorium. He early developed modernistic tendencies, and produced a system of harmony in which the scale is considered to be built up by a series of perfect fourths added one above the other; since all notes must fall sooner or later within the series, he refused to regard any combination of notes as fundamentally discordant, and filled his music with dissonant intervals. The general effect is, however, romantic rather than severe. His works include symphonic tone-poems and many compositions for piano. Later in life he developed a highly mystical quality of thought, to which he sought to give expression in his music.

SCRIBE, *skreeb*, AUGUSTIN EUGÈNE (1791-1861). A French dramatist, born in Paris. He was master of the technique of the stage, and later dramatists learned much from him. Scribe is best known for his librettos of *Fra Diavolo* and *Les Huguenots*, two operas frequently revived.

SCRIBES. About the time of the return of the Jews from the Babylonish Exile, their eagerness to conform to the law called into existence a body of men whose work was to study, copy, and expound it. These men were called the scribes. The earlier scribes were priests (see **EZRA**), but in later times this was not the rule. In Christ's day, they were designated as doctors of the law, and acted not only as expositors and teachers, but also as judges in the Sanhedrin (which see). They were highly revered by the people. Some had special classrooms in the Temple, where they taught those who were to become rabbis. Those scribes not sufficiently learned remained copyists. Most of the scribes belonged to the party of Pharisees, and they constituted the scholarly leaders of that body. In Matthew xxiii. 14 to 25, Christ is recorded as rebuking the scribes and Pharisees for their hypocrisy.

SCRIPTURE. See **BIBLE**.

SCROFULA, *skrof' ū la*. A form of tuberculosis which is characterized by swelling of the lymph glands and by poor nutrition of the tissues. Usually, the glands in the neck are affected, but the infection may occur in many lymphatic glands, and in many cases, abscesses form in the swollen parts. A local operation may be necessary in cases of abscess.

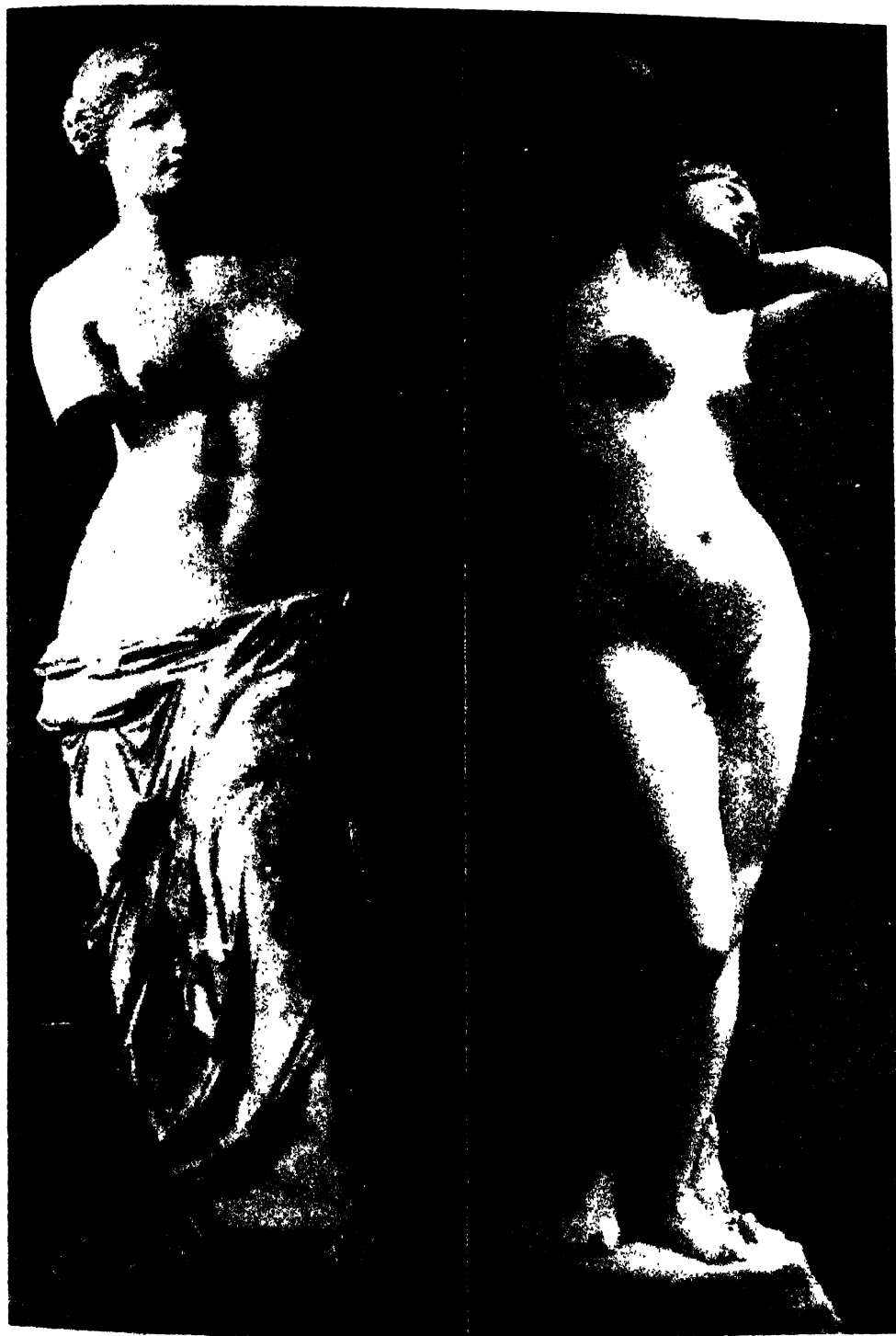
In England scrofula was formerly called the *king's evil*, because it was believed that a victim could be healed if his sovereign touched him. There is a well-founded story that Samuel Johnson, at the age of three, was taken to London to be touched by Queen Anne. The practice is supposed to have originated with Edward the Confessor.

SCRUPLE, *skru' p'l*. A measure of weight used only by apothecaries. There are three scruples in a dram, twenty-four in an ounce, and 288 in a pound. The scruple is equivalent to twenty grains. The scruple was the lowest denomination of weight among the Romans, being the twenty-fourth part of an ounce (*uncia*) or the 288th part of a pound (*libra*).

The word is from the Latin *scrupus*, meaning "a sharp stone," and, figuratively, "uneasiness of the mind."

SCULPTURE. The art of designing in relief or in the round; it is amongst the earliest of the arts practised by men.

Sculpture falls naturally into two categories, separated widely in technical approach, and demanding different treatment at the hands of the sculptor: *carving*, in which the material—stone, wood, or ivory—is chiselled, filed, or rubbed down to the intended shape; and *modelling*, derived from pottery, in which some pliable material, usually clay or wax, is built up into the finished work and then undergoes some process to render it durable. That most



Left: The "Venus of Milo"; Greek sculpture of the fourth century B.C. Now in the Louvre, Paris
Right: "Venus" by Laurent Marquette, in the Luxembourg Museum, Paris
Photos: Mansell

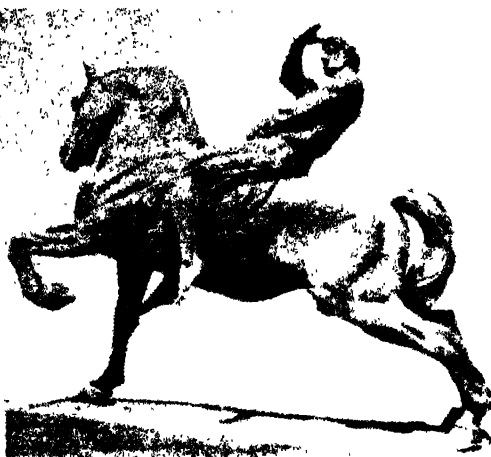
commonly employed is *casting in bronze*, the molten metal being poured into a mould taken from the clay figure; but in the process known as *terra-cotta* the clay itself is baked in a kiln.

These techniques lend themselves to different styles of expression; carving, the more architectural form, requiring an austerity and dignity of design that would be clumsy if it were translated into clay, whilst the modeller can work with a freedom which, in stone, would be extravagance.

The earliest examples of sculpture are the carved tusks and incised reliefs that have

sculpture, at its best, has a powerful simplicity that misses no subtlety of shape. What heights it could attain are shown in the relief carving of a horse from the tomb of T'ang T'ai Tsung (A.D. 627-647) in the University Museum of Pennsylvania.

In Egypt we first recognize the influence that were to shape European sculpture. It was a religious art, occupied mostly with the mysteries of a hieratic priesthood; in its decline it became little more than hieroglyphic; but in the plenitude of its power it gave the world some of the most magnificently impersonal statuary it has yet seen.



MODERN STATUARY (1)

Left: "Night," one of the works by Jacob Epstein on the London Passenger Transport Board, building in London. Right: Physical Energy, by Watts

Photos: London Passenger Transport Board, Mansell

been recovered from the wreck of palaeolithic civilization. Since then every great period of human culture has left us magnificent legacies in stone or bronze or ivory. But there have been civilizations, such as those of China, Mexico, and India, that have stood apart from the main current of human development. It is, indeed, possible to trace affinities in their work with the art of other countries. The Mayas and Aztecs, isolated as they were on the American continent, betray in their barbaric and overwrought reliefs a reminiscence of Egyptian and Assyrian sculpture; and the heavy ornamentation of Indian temples is not free from contagion of the outside world; but these styles played little part in shaping the trend of the history of sculpture.

This is true also of China, which, from the eleventh century B.C. onwards, was producing sculpture, exquisite in workmanship, of unrivalled subtlety of form, without exercising more than a remote influence on the minds of other peoples. And yet Chinese

Perhaps something in his religion turned the mind of the Egyptian sculptor toward eternity. It is true, at least, that the characteristic of Egyptian statuary, permanence. These colossal figures, the statue of Khafren (4000-3000 B.C.) in the Cairo Museum, seem to have an inner life that will outlast time. But side by side with such remote figures, the Egyptian sculptor could produce portraits of intense human vitality like the Sheikh El Beha (4000-3000 B.C.), also at Cairo, and the Scribe, of the same period, in the Louvre.

Assyrian art was less religious, more concerned with glorifying the triumphs of its rulers. In some ways a more human art, it was also more cruel. In the great friezes from the palace of Assurbanipal (seventh century B.C.) we see Assyrian sculptors at the zenith of their powers, handling crowded groups of men and animals with consummate ease, combining a convincing naturalism with an assured grasp of design, and occasionally, as in the figure of a dying lioness in one



EXAMPLES OF FIGURE SCULPTURE

1. Head of Queen Nefertiti, Egyptian portraiture of the eighteenth dynasty—seventeenth to fifteenth centuries B.C. 2. Egyptian statuette. 3. "Faun," a Greek bronze of the first century B.C. 4. "Commodus," Roman portrait bust of the second century A.D. 5. "Virgin and Child," an Italian carving of the twelfth century. 6. "St. Anne," English woodcarving of the fifteenth century. 7. "Madonna and Child," fifteenth century Italian carving. 8. "The Rape of the Sabines," a bronze. 9. "Monument to Colonna," Verrocchio's masterpiece of equestrian sculpture. 10. "Cupid and Psyche," marble group by Antonio Canova. 11. "Mercury and Psyche," by Adrian de Vries: a fine example of sixteenth century Flemish work.

of these panels, raising realism to the imaginative heights where it becomes symbolic of the beauty and tragedy of life. These friezes in the British Museum are, perhaps, our greatest legacy from the ancient world.

For with the rise of Greece we are in the world we know to-day, and it is difficult to find, except in the finest Christian sculpture, any nobler ideal than the serene humanism of the Greeks. The debt Greece owed to Egypt is especially marked in the Archaic period (until about 480 B.C.), when decorative conventions were somewhat rigidly adhered to; but with the close of the Persian Wars

Vulgarity was the canker at the core of Graeco-Roman art, and during its decay in the third century A.D. it displayed a sadly impertinent frivolity. Christianity had come to wreck the pagan world, and for a time Byzantine Iconoclasm reduced sculpture to conventional symbolism of almost forbidding austerity. The Byzantine contribution is the exquisite work in carved ivory of the tenth and twelfth centuries.

The Romanesque and Gothic revival springs directly from the Byzantines. Sculpture becomes intimately associated with architecture, and to very few even of the



MODERN STATUARY (II)

Left, "The Kiss," by Auguste Rodin (1840-1917), now in the Luxembourg Museum. Centre "Prospero and Ariel," by Eric Gill. It is over the entrance to Broadcasting House, London. Right "Athlete struggling with python," by Lord Leighton (1830-1896). Now in the Tate Gallery.

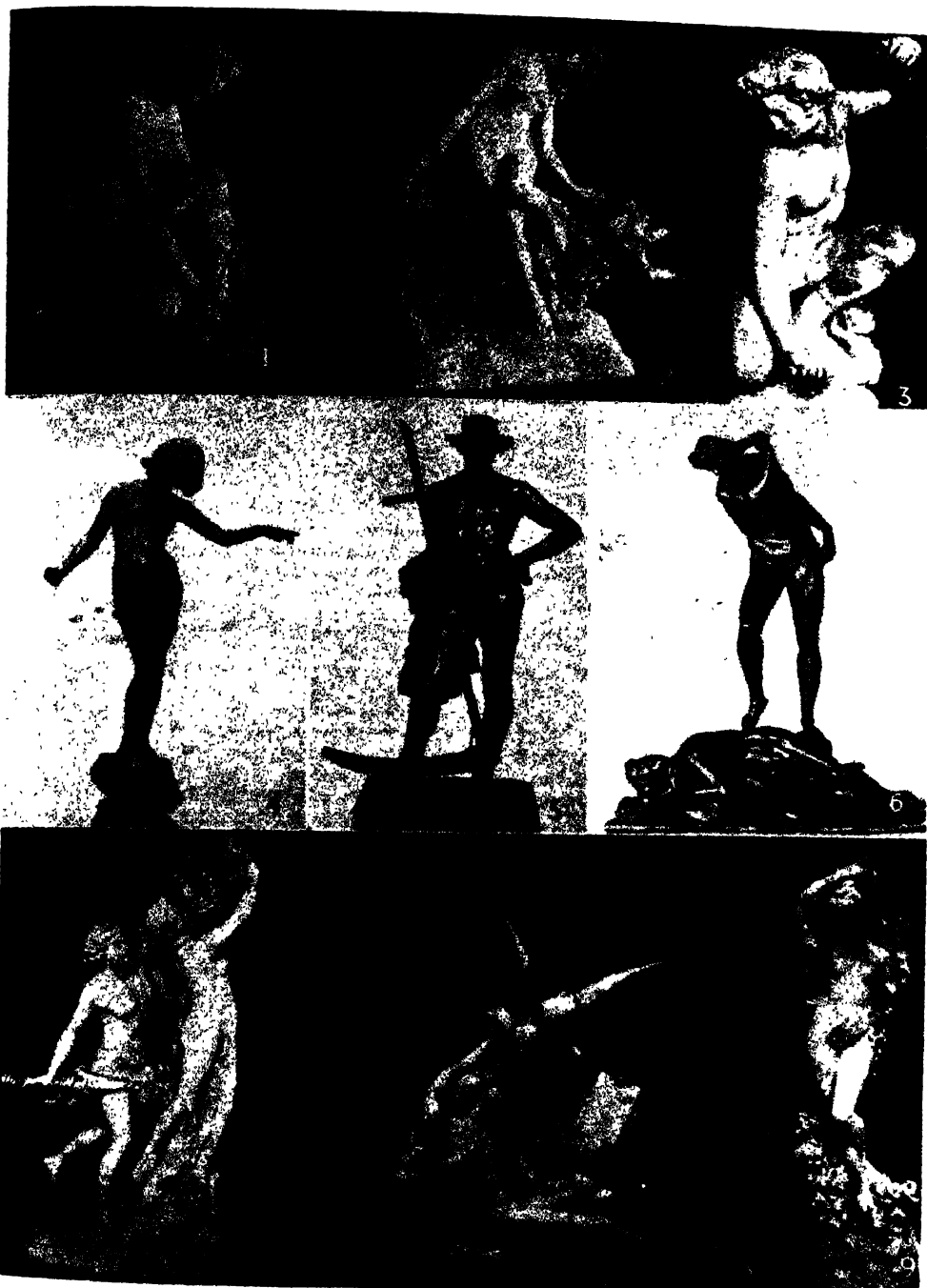
Photos: B.B.C., Mansell

there comes the flowering of that genius which is typically Attic. In the frieze of the Parthenon, the marble figure of Ulysses, the mutilated but magnificent group of the three Fates (later fifth century B.C.), all of them now in the British Museum, we can see the serenity, the power, the union of an idealized naturalism with an austere restraint, which marked Athenian sculpture under Pericles. A tenderer, more intimate, glimpse of the Greek mind is seen in the small statue of a boy pulling a thorn from his foot (fourth century B.C.), which is also in the British Museum.

From the first century B.C. a Graeco-Roman style began to develop in which the aloof humanism of Greece was tempered to something more intimate and individual. In the Roman portrait busts we recognize the birth of realism, the search for individual character, an energy and a vulgarity that had not appeared till then in sculpture.

greatest achievements can we give the name of any sculptor. In its asceticism, its grotesque humour, its fertile and lively invention, its realism and its mysticism, the Gothic style expressed with triumphant completeness the mind of medieval Christianity. In England the carvings in the crypt of Canterbury Cathedral are amongst the finest examples of native Gothic; whilst the alabaster carvings of the fourteenth and fifteenth centuries are very typical of medieval English workmanship. In France Chartres Cathedral rivals any church in the world with the inspired beauty of its elaborate carvings; the suaver Italian style is represented by Giovanni Pisano (1250-1320 A.D.); and, in Germany, Tilman Riemenschneider (d. 1531) brought to the fervour of northern Gothic something of Italian grace.

Meanwhile, in Florence, Lorenzo Ghiberti (1378-1455) had ushered in the Renaissance, designing the bronze reliefs on the doors of



SCULPTURE, RELIEF AND FIGURE

1. "Atalanta's Toilet," by J. Pradier: in the Louvre. 2. "Bacchante," by Cesare Fantacchiotti.
3. "Cupid," a masterly figure by Michelangelo, now in the Victoria and Albert Museum. 4. "Folly," by Onslow Ford, in the Tate Gallery. 5. "The Mower," by Sir W. Hamo Thornycroft. 6. "Virtue conquering Vice," by Benvenuto Cellini, a famous Italian metalworker of the sixteenth century. Now in the Victoria and Albert Museum. 7. "Apollo and Daphne," by Bernini, the seventeenth-century master of the Baroque School. Now in the Borghese Gallery, Rome. 8. "Immortality," by Leon Longepied. In the Luxembourg Museum, Paris. 9. "Psyche," by V. Pochini.

Photos: Victoria and Albert Museum; Mansell



STONE AGE SCULPTURE

Pair of reindeer (male following female) carved on point of mammoth-tusk (Montastruc, Bruniquel, S. France: La Madeleine period).

Photo: British Museum

the Baptistery which Michelangelo thought worthy to be the gates of Paradise. Donatello (1386-1466), drawing inspiration from the rediscovery of antique sculpture, gave to his figures and portrait busts a tender classical grace that lacked nothing in dignity; Verrochio (1435-88) achieved the world's masterpiece of equestrian statuary in his *Colleone*; and Michelangelo Buonarroti (1475-1564) set the seal upon a great age with the heroic figures for the unfinished tomb of the Medici. The stimulus that had spurred men on died away in the quarrels of the Reformation and the Counter-Reformation. A livelier, more frivolous, school succeeded the high seriousness of the Renaissance. This style, of which Bernini (1598-1680) is the typical master, is called the Baroque. It is characterized by theatrical boldness of statement, broad yet elaborate handling, and a dramatic vigour which falls readily into bombast.

The growing wealth of the nobility and the mercantile classes led to a revival of portraiture, of which the busts of Houdon (1741-1828) in France and Roubillac (1695-1762) in England are fine examples.

The French Revolution ended the lingering agonies of the feudal system, and closed the chapter that began with the Renaissance. France became the pivot of the artistic movement that started with the florid romanticism of Rude (1784-1855) and Bayre (1795-1875), and found its clearest expression in the "impressionist" sculpture of Rodin (1840-1917). Rodin, more assured in his handling of clay than marble, combined

Romantic emotionalism and the Gothic delight in character with something of classical serenity, adding his own qualities of direct statement and nervous life. His technical sureness, his swift touch, and above all his masterly analysis of form into planes, have had a profound influence on the sculpture of our day. There is much of his work in the Victoria and Albert Museum, London.

We are in a transitional period to-day, and apart from the researches into the possibilities of pure form carried on by the post-impressionists, no clear trend is discernible in modern sculpture. The work of Jacob Epstein (born 1880) may be said to attract most attention to-day, and he is possibly the most important influence. See illustration under classical subjects for examples of Greek and Roman sculpture.

SCURVY. A disease resulting from improper diet. Changes in the blood occur, causing weakness, anaemia, tenderness and swelling of the joints and muscles from haemorrhage into them, spongy gums and functional disturbances. Especially characteristic are the effects seen in the mouth, for the gums become swollen and they bleed easily; the teeth may loosen and fall out.

In the days of long sea voyages, when the sailors lived on salt beef and hard tack for weeks at a time, scurvy was very common on ships. Changes in conditions of sea travel and modern research in dietetics have made this disease comparatively rare.

Scurvy is prevented and cured by including in the diet foods that contain the scurvy-preventing Vitamin C (see VITAMINS)

Especially valuable foods of this class are oranges, lemons, tomatoes (either raw or cooked), raw cabbage and lettuce, celery and onions, cress, and fresh carrots (uncooked).

SCUTAGE, *shū' tayj*. See HENRY II (England).

SCUTARI, *sku' lah re*. (1) A city of Albania (which see). (2) A suburb of Constantinople (which see).

SCYLLA, *sil' a*. In Greek mythology, a six-headed sea monster, who was once a beautiful maiden, but was changed by Circe



SCYLLA
From a Greek vase in
terra-cotta.

Photo Mansell

because of the latter's jealousy. She lived in a cave in a great cliff, so high that the top could never be seen. It was her custom to thrust her heads out of the cave and seize the animals and men that passed. From every ship, each head took toll. Opposite the cliff of Scylla was Charybdis, another monster who continually drew in the water and threw it out again thus keeping the sea in turmoil. The ancients located the rock Scylla and the whirlpool Charybdis in the Strait of Messina, Scylla being the one next the Italian shore.

SCYTHIANS, *sith' ianz*. A nomad people of Asia, who inhabited the treeless plains from the Danube to the Volga. They were herdsmen, lived in covered wagons, and were filthy in their habits, never washing their bodies. They drank out of the skulls of the enemies they killed. In the seventh century B.C., the Scythians invaded Media. Most of them were exterminated, in the fourth century, by the Sarmatians. About 128 B.C. they overthrew Parthia (Persia). They invaded India about 125 B.C., and remained there for five centuries, becoming supporters of Buddhism.

SEA ADDER. See PIPEFISH.

SEA ANEMONE, *a nem' o ne*. A sea animal which is so called because it has much the appearance of a flower. The sea anemones, with the jellyfishes and corals, are placed in the phylum *Coelenterata* (which see), the third lowest major division in the animal kingdom. Anemones differ somewhat in size and form, but, in general, the body is vase-like, with fringes of tentacles about the mouth. The average diameter is 3 in., and the bodies show varying hues of bright colours. These animals usually remain fixed through life to rocks or other places of attachment, but

they have the power of slowly moving along on the base of the body. They are found in tidal pools and on the piles of wharves in harbours, as well as in deep water.

It is by means of its tentacles that the sea anemone obtains its food, which consists of a variety of small sea animals.

Scientific Name. Sea anemones belong to the class *Actinozoa*. A common species is *Metridium marginatum*.

SEA COW. See MANATEE.

SEA CUCUMBER. Name given to one of a class of marine animals related to sea urchins. They have long, rounded bodies, shaped somewhat like the familiar garden vegetable. At one end of the body there is a large mouth opening, encircled by a series of branching tentacles. These the animal expands and contracts as it seizes its food. It has five double rows of tube feet. There are several hundred species. Those inhabiting tropical waters sometimes grow to be 2 or 3 ft long, but the sea cucumbers of temperate regions are only a few inches in length. Large numbers are caught in the East Indies and sent to Chinese markets as *trepang* (which see).

Classification. Sea cucumbers constitute the class *Holothuroidea* in the phylum *Echinodermata*. See ECHINODERM.

SEA ELEPHANT. See SEAL.

SEA HOLLY OR ERYNGIUM. A tall perennial plant sometimes grown in gardens for its distinctive thistle-like flowers of metallic blue and its ornamental foliage. The flowers when dried are everlasting. The best known variety is *E. amethystinum*.

SEA HORSE. See HIPPOCAMPUS.

SEA KALE. See CHARD.

SEAL. A warm-blooded, air-breathing animal which has its various body structures



BABY SEALS

so modified that it is able to live in the water as well as on the land.

A seal has a tapering body, with thick, woolly fur and long, shining hair. It has a tail, but this is so short as to be practically useless, while the limbs also are short, the greater part of their length being hidden

beneath the skin. The head is small and round, neck short, and the mouth large and provided with numerous "feelers," like those of cats.

The Caspian Sea and Lake Baikal have two species of seals, but with these exceptions all members of the family live in the ocean. A few species live in the seas of the temperate and tropic zones, but they are most commonly found toward the far north and the far south.

Kinds of Seals. A thoroughly satisfactory classification of seals has never been made, but a simple, serviceable division separates them into two groups; these are the *eared seals*, which have external ears and for the most part soft fur under their long hair, and the *true seals*, which have no external ears and no fur. To the former group belong the *fur seal*, or sea bear, and the *sea lion*; while in the latter are included the *common seal*, or harbour seal, the *harp seal*, abundant off Newfoundland, and the *elephant seal*, or sea elephant. In zoological classification, the seals are placed with the walruses in the group of flesh-eating mammals called *water carnivores*. See CARNIVOROUS ANIMALS; WALRUS.

The Fur Seal. By far the most important commercially of all the seals is the fur seal, for it has a valuable soft, dense fur, usually brownish-black, which is almost hidden by the outer hair.

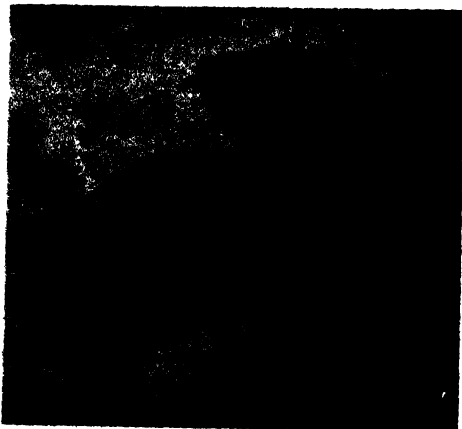
A bull seal may exceed 400 lb. in weight; the cows are rarely more than one-fourth as large. Each bull



ESKIMO SEAL HUNTER

He is waiting at a blow-hole to harpoon the seal as it comes up to breathe.

Photo: U. S. I.



YOUNG SEA LION AT BLOW-HOLE

Photo: Cherry Kearton

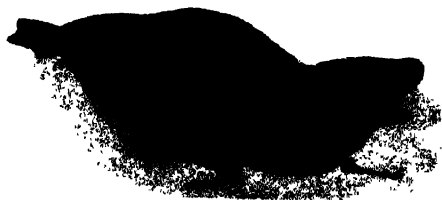
gathers about him as many females as he can, sometimes as many as a hundred at a time. Over these he exercises the strictest control. Hundreds of the females are torn to pieces every year by contending males, and the rocks re-echo with the roaring of the fighters.

The pups are sleek little animals, weighing about 10 lb. each. Soon after her baby's arrival, the mother seal swims away in search of food. The little seals are left in a great group, or *pod*.

Until November or December, according to the weather, the herd remains on its favorite *rookery*. Then the great herd puts off into the sea until another spring.

Securing Sealskins. The young males are the class killed for fur. Since the old bull will not allow them to set up families until they are 7 or 8 years old, the young male herd by themselves, and the hunters kill

them by clubbing them when they are on land. The skins are salted and packed in the holds of vessels until the close of the season. The coarse grey hair is removed,



HOODED SEAL

leaving the soft fur exposed, and the skin is carefully dyed.

Sea Lion. This is another eared seal, a near relative of the fur seal, from which, however, it differs in one important point. It is a hair seal, that is, it has not the soft under fur which makes the other so valuable commercially. There are two chief groups of sea lions, the so-called Steller group and the California sea lions. The former reach the greatest size of any of the eared seals, the males attaining a length of from 10 to 15 ft. and a weight of from 1000 to 1300 lb. In all the Northern Pacific, from California to Japan, these huge animals are to be found.

True Seals. Of the true seals, the commonest is the small yellowish-brown harbour seal. Like the fur seals, the harbour seals are in danger of extermination, for, while they have no fur, they yield a valuable oil, and their skin is used for leather. Another true seal is the *hooded*, so named because the male has a hoodlike sac upon the head. It is an inhabitant of the North Atlantic and the Arctic Oceans.

Sea Elephant, or Elephant Seal. This is the largest of the true seals, a huge creature which may measure 30 ft. in length. It is a hideous-looking animal, with its small eyes, long, tusk-like teeth, and the short, wrinkled



ELEPHANT SEALS

Photo: Photopress

trunk, which gave it its name; but it is very valuable, for a single male has been known to yield over 200 gallons of oil. They are found to-day only on some of the islands of the Southern Pacific.

Scientific Names. True seals constitute the family *Phocidae*; the eared seals, the family *Otariidae*. The fur seal of the Pribilof Islands is *Callorhinus alascanus*; the sea lion of the North Pacific is *Eumetopias stelleri*. The harbour seal is *Phoca vitulina*; the harp seal, *Phoca greenlandica*; the hooded seal, *Cystophora cristata*; the sea elephant, *Macrorhinus leoninus*.

SEAL. Usually a figure, lettering, or other device impressed on paper, metal or wax, to be attached to a document, together with a signature. Seals are made from a matrix or metal die, and sometimes from a gem. The practice of using a seal on documents of importance has been followed without interruption since the fifth century before Christ, in the golden age of Greece. In Rome the Popes very early began to attach leaden seals to their official communications, these



SEA LION

Photo: Cherry Kearlton

seals, called *bullae*, gave rise to the *bull* of the Popes.

It was once customary to wear a ring, called a *signet ring*, flattened at the top, on which was engraved some special device. This was ordinarily an ornamental finger ring, and was used to seal letters and documents, the design being pressed on a drop of hot wax on the surface of the parchment.

Seals of Government. Every country, province, and state has an official seal, without which no legislative act can go into effect. Such a seal must be affixed by the Minister in whose custody the official seal reposes. See **PRIVY SEAL**.

Derivation. The word *seal* is derived from the Latin *sigillum*, meaning "a little mark" or "sign" (diminutive of *signum*).

SEA LAVENDER. The general name for a number of perennial plants which flower from late June until autumn. The name is due to the fact that they like marshy ground near the sea shore. The stem is 6 in. to 11 in. high and the lavender coloured flowers are borne in a tight cluster on short one-sided spikes. Leaves are large, oblong and fleshy and grow direct from the root. The flower does not die away when picked but, like the sea-pink (which see), dries up and retains much of its beauty.

Scientific Name. The sea lavenders belong to the thrift family, *Plumbaginaceae*. The common sea lavender is *Statice limonium*.

SEA LILIES, OR CRINOIDEA, *krin oi' dia*. A class of sea animals of very limited numbers. Some species are found in shallow water about coral reefs, either attached or free-swimming. A typical form has a cup-shaped head, or calyx, which contains the vital organs, and a jointed limestony stem. About the head radiate the feather-like arms whence the name *sea lily*. Crinoidea are classed with the *echinoderms* (which see).

SEA LION. See SEAL.

SEALYHAM. See TERRIER.

SEANCE, *say' ahns*. See SPIRITUALISM.

SEA PINK, OR COMMON THRIFT. A plant that often grows so close to the sea that it is covered at the higher tides. It bears a dense round pink head of flowers on the top of a leafless stem, rarely more than 9 in. high, though it may be 12 in. The flowers are divided by bracts and an outer ring of bracts encloses the head, and bracts also form a sheath to the top of the stem. The leaves grow from the roots. The sea pink is perennial and flowers from April to September.

Scientific Name. The sea pink belongs to the thrift family, *Plumbaginaceae*. It is *Armeria maritima*.

SEAPLANES. Aircraft capable of rising from or alighting upon the water. The principal types are *amphibians*, which are fitted with landing gear by the use of which they can rise from or land on the earth as well as on the water; *float seaplanes* with a "landing" gear of floats or pontoons which can alight only on water; and *boat seaplanes*, the centre of which is a boat, and these also can alight only on water. Adding floats to an aeroplane naturally increases the weight and diminishes the carrying capacity. Notwithstanding this, seaplanes have a very high speed and have attained the highest speeds recorded. The purpose of the float or hull forms is to act as hydroplanes as the aircraft rises from the water. As speed increases above the water the hydrodynamic forces acting upon the float cause it to rise. The displacement and resistance are thereby diminished. See also FLYING BOATS.



SEAPLANE

One of the machines with which Great Britain won the Schneider Trophy

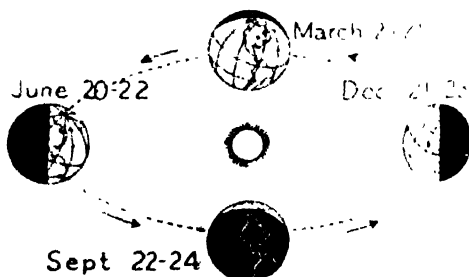
Photo. Fox

SEARCHLIGHT. See ELECTRIC LIGHT.

SEASICKNESS. An illness resulting from the pitching and rolling of a vessel at sea. The symptoms are dizziness and pain in the head, nausea, a sinking sensation in the stomach, and vomiting. In case of a severe attack, the skin becomes pale, almost green, and damp, the pulse is feeble, and the person is exhausted. Of several theories advanced to account for seasickness, the one most generally accepted attributes the ailment to disturbance of equilibrium in the semi-circular canals of the ears. See EAR.

Persons susceptible to seasickness may lessen the severity of attacks. During the week preceding the voyage, care should be taken to keep the bowels active. Sufficient sleep and exercise in the open every day will help. Lying quietly in a steamer chair on deck, with the eyes closed, helps to overcome the nausea if the sea is rough.

SEASONS. The periods into which the year is naturally divided, by change of temperature, and by alterations in the lengths



THE SEASONS

In summer, the northern part of the Earth is more than half in sunshine, and the southern part is more than half in darkness. Thus, a point in the north has daylight during the greater part of the twenty-four hours of the day. The farther north one goes the more daylight he finds, and around the Pole there is no darkness during this season. In the winter conditions are reversed.

of the days and nights. In the course of a year, the earth revolves round the sun, always with its axis tipped or inclined 23½° toward the plane of its orbit. For about half

the year, the vertical rays fall north of the equator. About the 21st of June, they are farthest north, and astronomical summer begins in the northern hemisphere and winter in the southern. On the 22nd December, the conditions are exactly reversed. About the 20th of March, the sun is at the vernal equinox, and about the 23rd of September, at the autumnal equinox; on these days, the sun is directly over the equator. In the northern hemisphere, spring and autumn respectively begin on these days. Thus spring extends from the vernal equinox (20th March) to the summer solstice (21st June); summer from the summer solstice to the autumnal equinox (23rd September); autumn, from the autumnal equinox to the winter solstice (22nd December); and winter, from the winter solstice to the vernal equinox.

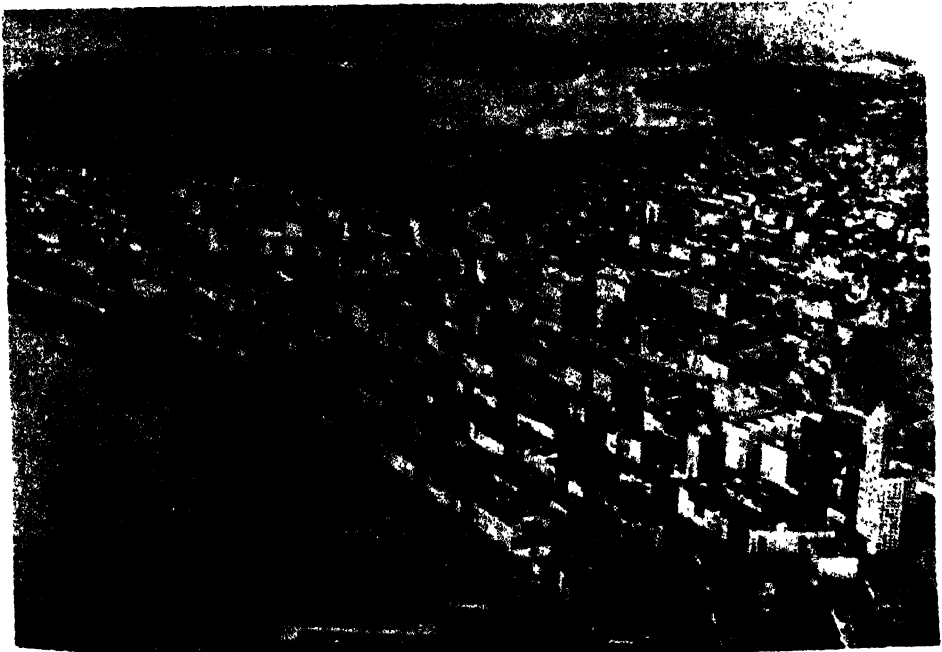
In the Temperate zones, there are four periods generally comparable to the astronomical seasons, but in the Torrid Zone, there is usually only a wet and a dry season. The Polar regions, too, have only two seasons, winter and summer.

SEA SQUIRTS, OR ASCIDIANS, as id' tanz. A small group of marine animals whose common name has reference to their habit of ejecting water through one of two body openings. The adult sea squirts have leathery, bottle-shaped bodies and remain

attached through life to stones, shells, and other fixed objects. Some live in colonies. The larva, a free-swimming creature resembling the tadpole of a frog, possesses a notochord, or elastic rod, which extends through the tail. For this reason, modern zoologists place ascidians in the same main division as vertebrate animals, for they regard the notochord as a rudimentary backbone; in this classification, the larger division is called *Chordata*. The larva later loses many of its organs, and the adult animal is a different and degenerate creature. It receives food from water taken into the digestive tract through an opening found near the one from which water is ejected. These openings are at the end of a projection called the *siphon*.

SEA TROUT. A silvery fish with X-shaped spots. It ascends rivers to spawn and founds freshwater colonies in each lake and river visited. It is the parent of all the trout species.

SEATTLE, se at' l, WASHINGTON, U.S.A. The largest city of the Pacific North-west, one of the most important seaports on the Pacific coast of America; situated on the east shore of Puget Sound, 926 miles by water north of San Francisco. Lumbering, flour-milling, meat and fish tinning and machinery manufacture are leading industries. Population, 365,583 (1930).



AERIAL VIEW OF SEATTLE

Photo: U & U.

SEA URCHIN. An animal belonging to the same group as the star-fishes, sea lilies, and sea cucumbers, having the body covered with tiny limestone plates bearing hinged spines. On its lower surface, the sea urchin has a circular opening containing the mouth;



SEA URCHIN

Photo: Visual Education Service

on the upper surface are the openings through which the eggs emerge. Through tiny holes in the body covering, the animal thrusts out tube feet having sucking disks. With these suckers it draws small animals into its mouth, which has five sharp teeth for grinding the food. The tube feet are used also as organs of locomotion, and some of them are employed as feeling tentacles.

Classification. Sea urchins constitute the class *Echinordea* in the major division *Echinodermata*. See *ECHINODERMS*.

SEAWEED. In popular usage, any plant that grows in the sea; in a botanical sense,



GATHERING SEAWEED FOR FERTILIZING AT MOUNTS BAY, CORNWALL

Photo: Topical

the name refers chiefly to the brown and red algae. Seaweeds are thus related to the green pond scums of stagnant water, but not to the more highly organized aquatic plants. The seaweeds of cold waters are chiefly brown algae; those of the tropics are red algae. Typical brown algae are the *giant kelps* of the Pacific. The stems of these

giant kelps sometimes grow to over 100 ft in length. Seaweeds are often harvested and converted into fertilizers. They are one source of the chemical element iodine. Irish moss, an edible seaweed, belongs to the red algae. See *ALGAE*; *WATER PLANTS*.

SEBACEOUS, *se bay' shûs*, **GLANDS**. See *SKIN*.

SEBASTIAN, *se bas' tian*, **SAINT** (died A.D. 288). One of the early defenders of the Christian faith, who was put to death by the Emperor Diocletian. He entered the Roman army, found favour with the Emperor, and became commander of the first cohort at Milan. His religious faith having been discovered, he was condemned to death, tied to a tree, and shot with arrows by a troop of archers. He was left as dead, but life was not extinct, and he was cared for in the home of a Christian lady named Irene. After his recovery, he again publicly professed his faith. Thereupon the Emperor ordered him to be beaten to death with clubs in the amphitheatre. His feast day is 20th January.

SEBASTOPOL. See *CRIMEA*.

SECOND EMPIRE. See *FRANCE* (History).

SECRETARY BIRD. Name given to a large bird of prey, about 4 ft. long, found in South Africa. It takes its name from the tufts of feathers that project from the sides and back of its head, giving it a resemblance to a clerk, or secretary, with quill pens behind his ears. It has very long legs and tail, and usually it prefers to run rather than fly. Its food includes frogs, insects, lizards, small tortoises, and snakes. The last it may kill either by striking it with its wings or feet or by letting it fall to the ground from a height. In South Africa this bird is protected because it destroys snakes. It builds a bulky nest in a tree or bush. The eggs, two or three in number, are a dull white, spotted with rust colour.



SECRETARY BIRD

Photo: South African Railways

Scientific Name. The secretary bird is the only representative of the family *Serpentariidae*. Its scientific name is *Serpentarius secretarius*.

SECRETARY OF STATE. Originally in Britain there was only one Secretary of State, but as far back as 1688 we find the office divided between two Secretaries, for the Northern Department and the Southern Department respectively. These became later the Foreign Secretary and the Home Secretary. As the duties have become more onerous, so new Secretaryships have been created; there are now eight Secretaries of State legally sharing the one office, and all are Cabinet Ministers. See **HOME OFFICE**; **FOREIGN OFFICE**; **SCOTTISH OFFICE**; **AIR MINISTRY**; **INDIA OFFICE**; **COLONIAL OFFICE**; and **WAR OFFICE**.

SECRETION, *se kre' sh'n*. In physiology, this is the process by which various glands or membranes of the body separate certain materials from the blood and form them into new fluids. These fluids are called *secretions*. Examples are *bile*, secreted by the liver; *gastric juice*, made by digestive glands; *saliva*, poured from the salivary glands; and the lubricating fluid (*synovia*) which keeps the joint surfaces working smoothly. The fluids mentioned are known as *true secretions*, because they each have a special work to do. There are other fluids, known as *excretions*, which are separated from the blood by secreting glands, but which differ from true secretions in that they are discharged from the body as waste matter, e.g. urine and perspiration.

See **GLANDS**.

SECURITIES. See **INVESTMENT**.

SEDAN, *sé dahn'*. BATTLE OF See **FRANCO-GERMAN WAR**.

SEDATIVE, *sed' a tiv*. A drug or other remedy that exerts a soothing influence on the human system, or on some part of it. When acting on the system, sedatives produce their effects by working on the main nervous centres; they affect a part of the body by acting upon the ends of certain sensory nerves. Ice caps and cold compresses are effective sedatives for a stimulated heart, and are soothing in fever. These are examples of local effects. Cocaine is a sedative drug that has local effects. Chloroform and ether are examples of general sedatives that produce sleep when inhaled. Sulphonal and veronal produce sleep by acting principally upon the brain. Bromides and nitrate affect the nerve centres of the spinal cord. Bismuth and hydrocyanic acid are stomach sedatives. Anaesthetics, anodynes, narcotics, and hypnotics are different types of sedatives. See **ANAESTHETIC**; **ANODYNES**; **NARCOTIC**.

SEDGE. The name of a large family of plants closely resembling the grasses. Many species are found growing in clumps in damp places in almost all parts of the world. In the

sedges, the sheath which enfolds the stem is entirely closed, and the stems, often triangular, are usually solid; but the grasses always have the stem sheath split on one side. The spikelets of sedge flowers are small, each floweret being enclosed by one scale instead of by several, as in the grasses. The tubers of some species are good to eat; from the fragrant roots of others, perfumes are made; while the Egyptian papyrus, another species, had many important uses in antiquity, and is still utilized for making paper, cordage, and coarse cloth. The botanical name of the sedge family is *Cyperaceae*.

SEDIMENTARY ROCKS. Rocks that have been built up from matter deposited by the agency of water or wind. The materials of which sedimentary rocks are made may have their origin in matter produced by organisms found in the sea, such as carbonate of lime made by minute animal life. Limestone is the sedimentary deposit formed from this material. Out of gravel are formed conglomerates, sandstone is the compacted form of sand, shale, of silt and clay (mud). Sedimentary rocks are usually formed in layers, and in such cases are said to be *stratified*. A single layer is called a *bed* or *stratum*.

See **GEOLOGY**, **ROCK**, **STRATIFIED ROCKS**.

SEDITION (Latin *seditio*, an insurrection, lit., a going aside). A term applied to conduct which does not necessarily amount to the grave crime of Treason (see **TREASON**) but which tends or is meant to cause public disorder or induce discontent against constituted authority. Thus it is sedition to attempt by word, act or writing to bring the Sovereign or his ministers or officers or judges or the constitution or either House of Parliament into hatred and contempt, to attempt to stir up general disaffection, or to excite the King's subjects to attempt the alteration of any matter in Church or State otherwise than by lawful means. The publication of written or printed seditious words is called *seditious libel*, and if two or more agree to do any seditious act they are guilty of *seditious conspiracy*. All such conduct is a misdemeanour at common law.

SEDLEY, SIR CHARLES (1639?-1701). Sedley was notorious for his mad escapades (which Pepys mentions in his *Diary*) and famous for his wit and literary ability. Charles II connived at his intrigues and praised his prose style. Dryden also admired him as a writer and included him as *Lisidemus* in his *Essay of Dramatic Poesy* (1668).

Sedley wrote plays, poetry, and pamphlets, most of which are forgotten to-day. But his pretty love lyric "Phyllis is my Only Joy" is deservedly remembered, and his play

Antony and Cleopatra (1667) makes an interesting comparison with Dryden's play on the same theme, *All for Love* (1678).

SEDUCTION (Latin, *se-ducere*, to lead astray). A term which may be applied to any act of leading a person astray from the path of duty or virtue, but it most commonly denotes the obtaining of sexual intercourse with a woman by the use of improper persuasion or pretence. Seduction, provided the woman consents, is no offence, unless she is under the age of 16 or is feeble-minded, but where there is no genuine consent to the act, as where the woman submits in ignorance of its real nature, the seducer may be held guilty of the felony of rape (which see). Conspiracy for the purpose of effecting a seduction is, however, a crime. A seducer may be made liable for the maintenance of his illegitimate child (see **BASTARD** and **MAINTENANCE**), and he may be liable in damages to the parent or employer of his victim, this liability being in law based on an actual or supposed loss of her services. (In Scots law the seduced woman may sue on her own account if deceit has been used.)

SEEDS. That part of the fruit of plants from which another plant grows.

Not all plants have seeds, among the seedless groups are ferns, mosses, fungi, and seaweeds, which reproduce by spores (which see).

Parts of a Seed. The parts of a seed are the infant plant, or embryo, the food for the embryo, and the seed coat, which is a protective covering. The coat may be thin and smooth, as in the bean, or thick, rough, and hard, as in the peach stone. The food for the embryo, which consists chiefly of starch and albumen, is stored around it, as in



FRUITS DISSECTED TO SHOW SEEDS

(a) Lengthwise section of apple, showing position of seeds in centre. (b) Lengthwise section of cherry, with seed in centre. (c) Lengthwise section of part of blackberry. (d) Cross section of cranberry. (e) Lengthwise section of peach, showing seed in centre.

many cereals, or the food may be almost entirely absorbed by the embryo, which nearly fills the space enclosed by the seed coat. This is usually the plan in small seeds, but it is also characteristic of the bean, pea, and other seeds of comparatively large size. The second figure shows, in two cases (c, d), ripened flower seeds within their capsules (natural size), and in the other three

instances the individual seeds (considerably enlarged) are cut in section to show the position and shape of the embryo within the *endosperm* (nutritive tissue). The division of the embryo which develops into the two cotyledons is distinctly seen.

When a bean germinates, two thick leaves, shaped like the halves of the seed, are lifted above the soil, and are the first objects to



FLOWER SEEDS

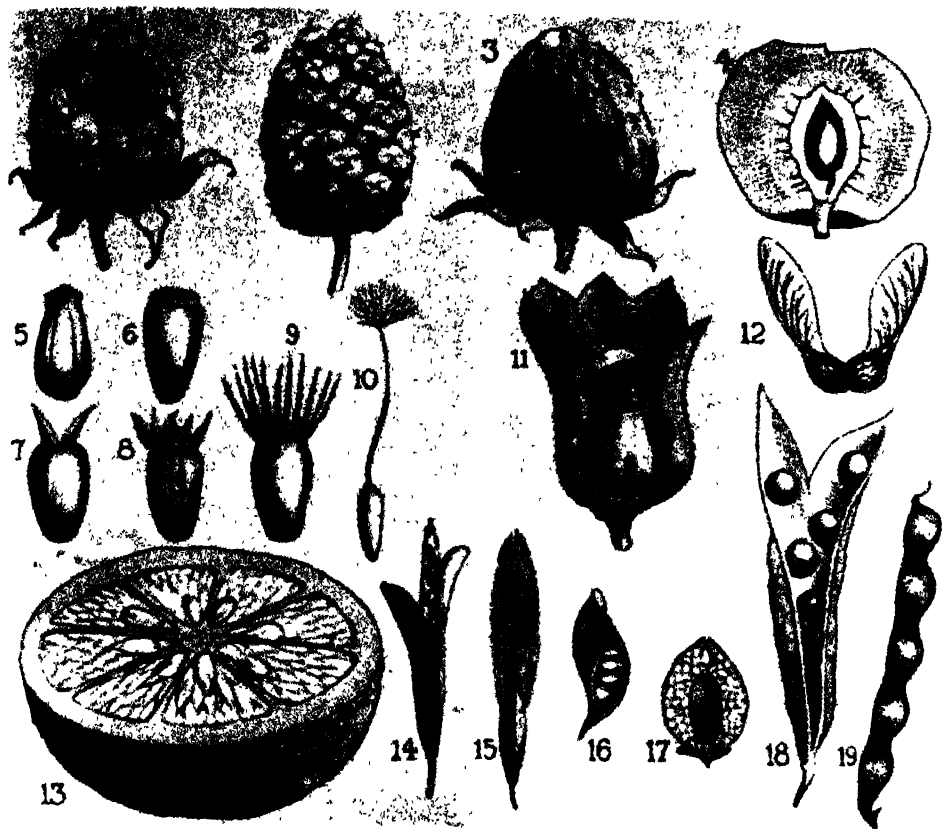
(a) Lengthwise section of a pansy seed. (b) Lengthwise section of a buttercup seed. (c) Capsule of violet, split open, showing seeds attached to placentae. (d) Cross-section of iris capsule. (e) Lengthwise section of poppy seed.

appear above the ground. Between them, we see the first bud, or plumule, ready to put forth its leaves. The two thick leaves contain the reserve food, and when the food has been absorbed by the growing plantlet they wither and fall. They are known as *seed leaves*, or *cotyledons*.

When wheat germinates, no true seed leaves appear above the ground. If we examine a wheat kernel, we see that the embryo is surrounded by plant food upon all sides. We cannot divide the seed into halves as we can the bean, because this food is all stored in one mass. That is, the wheat has only one seed leaf, or cotyledon. All plants having seeds with only one cotyledon are called *monocotyledonous* plants. Wheat, oats, barley, maize, and grasses are good examples of plants belonging to this division.

We have seen that the bean produces seeds with two seed leaves. All plants with seeds bearing two seed leaves are called *dicotyledonous* plants. The maple, elm, oak, and clover, besides the other plants named, are good examples of this division. Cone-bearing trees produce seeds with more than two seed leaves, and form the division of *polycotyledonous* plants. It should be noted that cone-bearers belong to the plant group having naked, or exposed, seeds, the *gymnosperms*. Monocotyledons and dicotyledons are *angiosperms*, and bear seeds enclosed in cases.

Seed Dispersal. The fruits of many plants are so constructed that they aid in seed dissemination; that is, in their dispersal by wind, water, and animals. The seeds themselves are fitted for long journeys, and can withstand conditions that would kill most plants. The seeds of wild plants are sown in unimaginable numbers by natural agencies



TYPES OF FRUITS AND METHODS OF PRODUCTION OF SEEDS

1. Raspberry. 2. Mulberry. 3. Strawberry. 4. Stone fruit of apricot, cross-section. 5. Camomile. 6. Rainfern. 7. Sunflower. 8. Black currant. 9. Cornflower. 10. Dandelion. 11. Henbane. 12. Wing fruit of maple tree. 13. Orange. 14. Crossflower. 15. Wing fruit of ash tree. 16. Buttercup. 17. Fruit of birch tree. 18-19. Legumes.

each year, making good the loss of vegetation due to all destructive causes. Owing to the lack of sufficiently thorough and rapid distribution, insect and plant enemies, and unfavourable conditions, only a small proportion of the seeds produce new plants.

Dispersal by Wind. The wind is the chief agent in scattering seeds. Some dust-like seeds, like those of the orchid, float in the air, and others are provided with downy, tufted parachutes or wings. The tufted seeds of the thistle and dandelion and those embedded in soft wool and silken hair, such as the cotton and poplar, are detached from their beds by the dry winds and warm sun, and are blown long distances. The seeds of the maple, elm, and ailanthus are equipped with membranous wings, and in others the fan-like petals of the dry calyx form the sails or parachutes which carry them to distant places. The wings and parachutes

of some seeds become detached after the journey through the air, others remain on the seed, and serve to fasten it in some place favourable for germination.

Whole clusters of fruits containing seeds, such as the white pine cone, are also blown from place to place.

Dispersal by Water and Animals. Water and moisture are also important agents in the dispersal of seeds. Water plants such as the lotus and also some varieties of palms, have floating seeds containing air, which buoys them up to the surface, and after floating for months they will germinate when lodged in the soil.

Other seeds are readily carried by animals. The fruits are provided with sharp spikes, hooks, or claws which catch in the animal's fur or man's clothing.

The seeds of edible fruits also are widely scattered by man and animals. The fruits of

the wild cherry, currant, and raspberry are often carried long distances by birds. They are then eaten, and the seed either dropped to the ground, or later expelled from the crop.

SEINE, *sayn*, RIVER. The most important river of France, rising 18 miles north-west of Dijon, and pursuing a general north-westerly course.

It is joined by the Aube, Marne, Meuse, Yonne, and Oise, and is connected by canals with the Loire, the Rhône, the Rhine, the Meuse, and the Scheldt. There is also a ship canal skirting the north shore of the estuary, between Havre and Tancarville. The Seine is navigable for 337 miles of its total length of about 480 miles.

SEISMOGRAPH, *siz' mo graf*. An instrument which records the occurrence of an earthquake and indicates its force and direction. A typical example, much used at the present time, has an inverted pendulum, held in a vertical plane by springs whose elasticity neutralizes the effect of gravity. The record of the earth disturbance is produced photographically upon a moving strip of sensitized paper or film. An interesting fact about this instrument is that it originated in China in the Middle Ages. See EARTHQUAKE; VOLCANO.

SEISMOLOGY, *siz mol' o ji*. The science of earthquakes (which see).

SELANGOR'. See MALAY PENINSULA.

SELBORNE, SIR ROUNDELL PALMER, 1ST EARL OF (1812-1895). Born at Mixbury, Oxfordshire and educated at Rugby, Winchester and Oxford, he was called to the Bar at Lincoln's Inn. Though he entered Parliament in 1847 as a Conservative, he gradually adopted Liberal opinions and joined the Palmerston ministry in 1861 as Solicitor-General.

In 1872 he became Lord Chancellor and was raised to the peerage as Baron Selborne. He was largely responsible for the framing of the Judicature Act of 1873, whereby the original jurisdictions of a number of independent courts were fused in that of the Supreme Court.

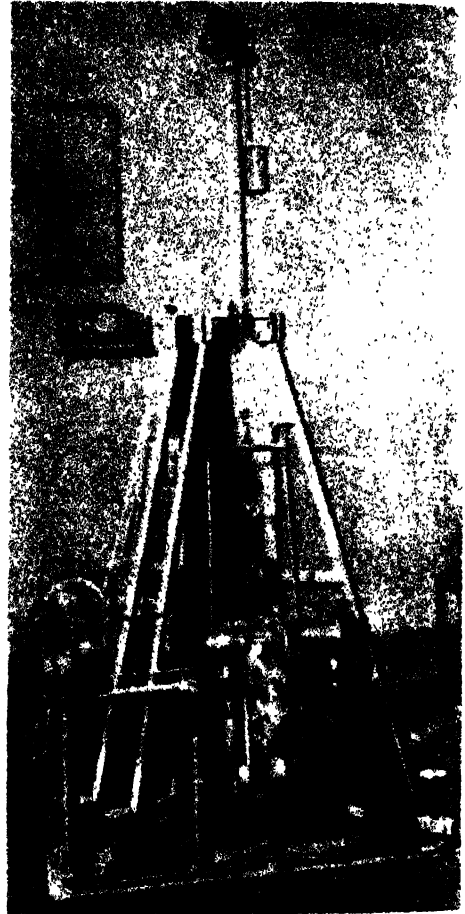
On the fall of Gladstone's cabinet in 1874 he retired, but returned in 1880 and was created Earl of Selborne.

SELENITE, *sel' en ite*. See GYPSUM.

SELENIUM, *sel id nium*. A chemical element having the symbol *Se* and atomic weight 79.2. It occurs in Nature in sulphur deposits in the Lipari Islands and elsewhere, also in combination with certain metals. Selenium was discovered in 1817 by Berzelius, and at the present time is obtained as a by-product of the smelting of pyrites. Like sulphur, it exists in an amorphous and metallic form, and when finely divided is red

by transmitted light, hence it is used in making ruby glass. As light increases its electrical conductivity, selenium is used in photo-sensitive apparatus in television and in the optophone.

SELF-DENYING ORDINANCE. See CROMWELL, OLIVER.



MODERN SEISMOGRAPH
Photo: U & I

SELF-HELP. In law, an expression used by certain jurists in referring to those occasions on which a person is entitled to take the law into his own hands. For example in the case of trespass to land, the landowner is entitled to eject the trespasser, using for that purpose no more force than is necessary. See ABATEMENT; NUISANCE; TRESPASS.

SELF-POLLINATION. See CROSS-POLLINATION.

SELJUKS, *sel jooks'*. The Turkish dynasty with which the nations of Christian Europe

came into conflict during the Crusades. This dynasty established itself in Syria and Asia Minor in the latter part of the eleventh century, setting up several independent sultanates. The last of these sovereignties endured until the close of the thirteenth century, and out of its ruins the Ottoman Empire rose. The Seljuks opposed the Shiite heresy. See CRUSADES.

SELKIRK. A Scottish Burgh, the county town of the county of Selkirk, with a population of 5667 at the census of 1931. It is served by the L.N.E.R., and is 40 miles south of Edinburgh, in a country where much of the land is in pasture or permanent grass used for grazing purposes; this is one of the great sheep-raising districts of the British Isles. Selkirk has woollen and cloth industries and, in addition, is an important market centre. Selkirk Castle, dating from the thirteenth century, is the most important in the county. Other antiquities include the old Mercat cross and the twelfth-century abbey ruins.

SELKIRK. This southern county of Scotland has an area of 170,793 acres and a population in 1931 of 22,608.

Physical Features and Scenery. The whole county falls within the region of the Southern Uplands and once comprised part of the Forest of Ettrick, one of the great hunting demesnes of the medieval Scottish kings. To day the face of the land has changed, and cultivation is carried on in the valleys with success. Most of the area consists of series of high plateaux with rounded crests covered with sparse grass suitable only for the rearing of sheep. Three principal ridges may be distinguished running parallel with the axis of the county, first, the highest ridge which marks the boundary between Peebles and Selkirk and the watershed between the Tweed and the Yarrow, secondly, a narrow ridge which practically cuts the county into two equal parts and is the watershed between the Yarrow and the Ettrick, and thirdly, a broader but much lower ridge running close to the south-eastern boundary, being the watershed between the Ettrick and the Teviot. Generally, the highest peaks are in the south-west, and there is a general slope from there to the north-east toward the main valley of the Tweed. The most northerly ridge frequently reaches 2000 ft., one of the highest points being Black Law, 2875 ft., on the Peeblesshire boundary. The central ridge also exceeds 2000 ft. in the extreme south-west (Capel Fell 2293 ft.). Toward the centre the highest point is Black Knowe, 1806 feet. The third ridge has Ettrick Pen, 2249 ft., but elsewhere rarely exceeds 1300 ft.

The longest river is the Ettrick, which has

a course of nearly 30 miles through the county, flowing north-west from Ettrick Pen, through Selkirk into the Tweed. The Yarrow also rises in the extreme south-west and follows a parallel course till it meets the Ettrick above Selkirk. In its upper course it flows through St. Mary's Loch, the largest sheet of water in the county. Both river valleys are wild and rugged.

History and Antiquities. The history of Selkirk outside the sphere of legend is concerned chiefly with the Border warfare, and during this period is practically indistin-



ON THE ETTRICK WATER, SELKIRK
Photo Taylor

guishable from that of its neighbour Peebles (which see). The oldest spelling of the word is Scheleschirche, and the first sheriffs of Selkirk date from the twelfth century.

Prehistoric antiquities are rare. Hill-top forts are much less common than in Peeblesshire, being confined to ten at the most. The most important is that of Torwoodlee Hill, near Galashells, which is indisputably a Celtic fort, almost perfectly preserved. Connected with this is a line of twin earthworks extending in a mainly southerly direction across the county, most probably of late Roman construction. The battle of Flodden Field is perhaps the best-known event to take place on Selkirk territory.

Agriculture and Industries. Less than one-tenth of the total area is arable land,

but more than half is either used as pasture land permanently or is capable of being so used. Sheep are numerous and the Cheviot breed predominates. Some cattle and pigs are bred in the lower valleys, where dairy-farming is becoming of increasing importance. Oats form the principal cereal, followed by barley, whilst root crops are represented by potatoes and turnips. Historically, the wool trade is of first importance, and Galashiels and Selkirk are the two chief centres. This industry has persisted from the sixteenth century to the present day.

Chief Towns. The county town is Selkirk (which see). The other burgh is *Galashiels* (population in 1931 of 13,102), the largest town in the county, and remaining the most important centre of Scottish cloth manufacture. It is also an industrial town engaged in engineering, foundry works and dyeing. Its incorporation as a burgh dates from the second half of the sixteenth century.

SELKIRK, ALEXANDER (1676-1721). A Scotsman whose experiences as a castaway had unexpected literary significance. While sailing in the South Seas on a freebooting expedition, he had a quarrel with the captain of the ship, and at his own request, was left upon the island of Juan Fernandez, about 350 miles west of Valparaiso, Chile (1704). Here he remained in solitude for four years and four months, until rescued by Captain Woodes Rogers of the British Navy.

His experiences on the island were recorded in two books of the sea, published in 1712, and Defoe's *Robinson Crusoe* is believed to have been based on these accoutns.

SEMAPHORE, sem' a fore. See SIGNALING AND SIGNALS.

SEMELE, sem' e le. A figure in Greek mythology, the daughter of Cadmus, king of Thebes. She was wooed by Zeus in the guise of a mortal, but Hera, taking the form of Semele's nurse, induced her to ask of Zeus that he appear before her in his divine glory. She then persuaded Zeus to grant to her any favour she might ask. He donned only his mildest glory, but even this was too much for the mortal eyes of Semele, who was burned to death in the blaze of light which surrounded him.

SEMICOLON. See PUNCTUATION.

SEMIRAMIS, se mir' ra mis. A legendary queen of Assyria, whom tradition has made the founder of Babylon and the conqueror of Persia and Egypt. The story relates that she was the daughter of a fish goddess and a Syrian youth, and that, when her mother abandoned her, she was fed by doves. Rescued by the leader of the king's shepherds, she finally became the wife of King Ninus of Assyria. After her husband's death, she entered upon a spectacular career of

conquest, but in the forty-second year of her reign, she was deposed by her son and disappeared. Herodotus mentions a queen of Babylonia named Semiramis who lived in the eighth century B.C.

SEMITES, sem' ites. A name often applied to one of the main divisions of the white race. The term *Semitic* comes from *Shem*, the name of one of the sons of Noah. In the Semitic group are included the Hebrews (Jews), Assyrians, Chaldeans, Phoenicians, Carthaginians, Arabians, Ethiopians, and various other peoples of similar physical and intellectual traits. It is an interesting fact that the three great religions which acknowledge one supreme deity—Judaism, Christianity, and Mohammedanism—had their origin with Semitic races. It was also from a Semitic people—the Phoenicians—that our alphabet came.

The Semitic languages are usually divided into northern and southern groups, the former including the ancient dialects of Assyria and Babylonia, and the Hebrew, Phoenician, and Aramaic tongues. The Assyrian and Babylonian languages have been preserved in the literary form by means of the curious wedge-shaped writings known as cuneiform inscriptions. To the southern division belong the Arabic and the Ethiopic languages; the latter survives in the religious literature of Ethiopia and in several dialects.

SEMOLINA. A meal prepared by grinding or crushing hard wheat into small rounded grains. It has a high nutritive value and is used not only as the basis of puddings, etc., but also, when kneaded with water, in the manufacture of Italian pastes, macaroni, and the French *pâtes alimentaires*.

SEMPACH, sem' pahk', BATTLE OF. See WINKELRIED, ARNOLD VON.

SENATE. A name commonly applied to the senior house of a legislature, and used in connection with the Congress of the United States and the upper houses of France, Canada, Italy and other nations, usually with some modification.

The word *senate* was first employed in ancient Rome. Its literal meaning was "council of old men," since it was an assembly composed of the heads of leading families.

Under the Republic, the Senate was composed of 300 patricians, plebeians, and high officials. Julius Caesar raised the number to 900, but Augustus decreased it to 600. Senators were originally appointed by the kings, later by the consuls, and finally by the censors, though the latter were compelled to follow rules established by precedent, by which the popular vote was decisive. At first, the Roman Senate was not a legislative body. If a king died without choosing

a successor, it was the duty of the *Senatus* to rule for a period of five days, each in his turn, until a king was selected. Other functions included a veto on laws passed by the citizens, and acting as an advisory body for the king. The power and dignity of the Roman Senate increased, and in the last two years of the Republic, that body was in the time of its greatest power.

SENECA, LUCIUS ANNAEUS (about 4 B.C.—A.D. 65). A Roman philosopher, one of the leaders of the Stoic school. He was born in the province of Spain at Cordova. After studying under the Stoic philosopher Attalus, he travelled in Greece and Egypt, gained a reputation in the law courts for his eloquence, and rose to the position of quaestor under the Emperor Claudius. In 41 he was banished to Corsica, but eight years later was recalled to Rome by the Empress Agrippina, and made the tutor of her son Nero. In 65 he committed suicide.

Seneca's extant philosophical writings are moral treatises on such subjects as *Consola-*

tion, Peace of Mind, and Giving and Receiving Favours. Ten tragedies are also attributed to him.

SENEGAL. A French colony in West Africa, between the Rivers Senegal and Gambia. Its area is 77,814 square miles. The inhabitants are chiefly Berbers and various Negroid races, numbering altogether 1,638,225; they are chiefly Mohammedans. There is a population of more than 6000 whites. The region is an undulating plain cut by river valleys and estuaries. In the north rainfall is poor and conditions are arid, but in the more favoured south extensive forests occur and the baobab, oil palm and banana grow. The natives live mainly along the rivers. In the drier parts they cultivate ground nuts, millet and maize and keep cattle, sheep and goats; in the wetter parts they grow rice and cassava. Cotton and ground nuts are now much grown for export. The capital is St. Louis (population 30,817 including 955 Europeans), having railway connection with Dakar (population 72,752).



SCENES IN SENEGAL

1. A wealthy matron with her son. 2. Bush village. 3. In the market place, Dakar. 4. The mother tucks baby into the back of her skirt, leaving her arms free.

Photos: George Long

with 10,145 Europeans), which is a better port and the seat of the Governor-General of French West Africa. Dakar is also a naval station and an airport on the South American route.

The colony is governed by a Lieutenant-Governor and an elected council.

French interests in this part of Africa were not important until 1854, though French traders had been on the coast a century earlier. From 1854 French influence grew and rivalled the British until, in 1890, French rights were admitted over vast areas.

SENEGAMBIA, *sen e gam' bia*. A name formerly applied to the territory between the Rivers Senegal and Gambia, on the west coast of Africa, now known as Senegal (which see).

SENILE DEMENTIA, *de men' shia*. See INSANITY.

SENLAG. A name applied by historians with doubtful correctness to the site of the Battle of Hastings.

SENNA. See CASSIA.

SENNACHERIB, *sen nah' er ib* (705-681 B.C.). A king of Assyria, the son of Sargon II, whom he succeeded. His conquests included Sidon, Ashkelon and Ekron. He also carried on war against Hezekiah, king of Judah, who was forced to pay him a heavy tribute, although later he was compelled to withdraw. He destroyed Babylon completely, and soon after was murdered by two of his sons.

SENSATION. A very primitive organism, such as the single-celled amoeba, will react to some changes in its environment. It will retreat from a place that is too hot or too cold. It will put out a jelly-like process to incorporate small bodies with which it comes into contact. But its powers of discrimination are strictly limited. Even in the matter of taking food, it will incorporate indigestible as well as digestible material. Now the amoeba is made up of only one cell, a cell which is generally sensitive, but only to a limited extent. Human beings are able to sense an immeasurably wider range of happenings and thus have the capacity for very much greater knowledge and more varied behaviour. This comes about through the fact that in our bodies—unlike that of the amoeba—there are a multitude of cells, and groups of these have taken on highly specialized functions. Thus in the eyes we have a special mechanism, or sense-organ, for dealing with light waves, the nervous elements at the back of the eyes being cells which are peculiarly and extremely sensitive to this particular kind of stimulation. The nerve cells in the ear are similarly sensitive to sound waves. Any sense-organ responds to its own particular form of stimulation, its

adequate stimulus, rather than to any other. Moreover, if it is affected at all by another form of stimulation, the result will be the same as when the adequate stimulus is used. Thus, a blow on the eyes gives rise to sensations of light.

The possession of sense-organs is not in itself enough to give us sensation. From the sense-organs nerves pass to the brain, and it is when the nervous impulse set up in the sense-organ has reached the appropriate brain centre that sensation occurs.

Traditionally man is supposed to have five senses. Actually he has rather more. Some senses are adapted to convey information about what takes place away from the body. Here we have the senses of sight, hearing and smell, the sense-organs for these being known as *distance receptors* because they receive stimulation from a distant source. Other sensations are aroused only when there is direct contact with the body. We have taste and what is popularly known as touch, but much better as cutaneous or skin sensations. For there is more than one type of sense-organ in the skin. There are separate mechanisms for light touch, superficial pain, heat and cold. Further sense organs for pressure and pain are situated beneath the skin.

Other senses tell us what is happening in our own bodies. There are the so-called *organic* sensations that arise from the viscera, the heart, digestive tract, bladder, reproductive organs, and so on. Other types of sense-organ give information about the positions and attitudes that our bodies assume and their movements. These sensations, which are known as *kinaesthetic* sensations, are essential to the maintenance of position and the control and adjustment of movement. Movement without this control through the kinaesthetic sense would be of the hopelessly unsuccessful kind shown by a person who tries to walk when his foot has "gone to sleep." Kinaesthetic sensations are aroused by the stimulation of sense-organs in the muscles, tendons and joints. See HEARING; NERVOUS SYSTEM, SIGHT, SMELL; TASTE.

SEOUL, *se ool'*. See CHOSEN.

SEPALS. See FLOWERS.

SEPARATION. A dissolution of married life without a dissolution of marriage. Separations are either *voluntary* or *judicial*. A voluntary separation is an agreement to live apart, usually made by deed. A judicial separation is a decree of the Court obtained on a petition by one of the parties to a marriage on the ground of some matrimonial offence committed by the other party. The grounds on which a separation may be ordered are: (a) adultery, (b) cruelty,

(c) desertion without just cause for two years, (d) non-compliance with a decree for restitution of conjugal rights, and (e) rape and unnatural offences.

The Court can order the respondent to provide an income for the maintenance of the petitioner (see **ALIMONY**) and can also give directions as to the custody of the children. See **HUSBAND AND WIFE**.

SEPIA. A dark-brown pigment prepared from the secretion found in the ink bags of certain species of cuttle-fish (which see).

SEPOY (from the Persian *sipahi*, horseman, soldier). A native of India who is employed in the army in India under British discipline. The term is used to distinguish these men from European soldiers, called *gora*, i.e. of fair complexion. The description "sepoys" was used in Southern India even before the East India Company maintained troops in Bengal, but its use only became general in conjunction with British administration.

SEPTEMBER. In the calendar of Charlemagne, this was called the "harvest month," and it still bears that name in Switzerland. The Anglo-Saxons were more specific in their choice of a name, and called September the "barley month."

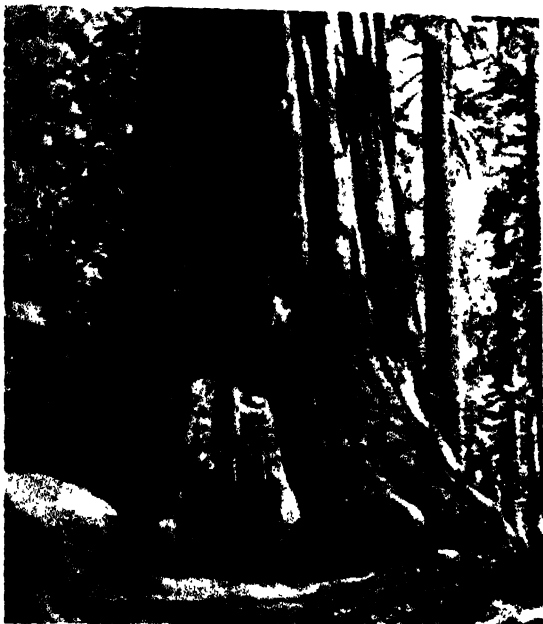
It has always had thirty days since Roman times; it has not always been, however, as it is today, the ninth month. Before the calendar was revised by Julius Caesar, it was the seventh, the name being derived from the Latin *septim*, "seven." The birthstone for September is the sapphire (or chrysolite).

SEPTICAEMIA, *sep ti se' mia*. A form of blood-poisoning caused by pus-forming micro-organisms which make their way into the blood-stream, and so give rise to trouble wherever the blood carries them, that is, all over the body. It is caused by a primary seat of inflammation, whether in a wound or a diseased organ such as occurs in appendicitis, in which these germs first settle and multiply. Thus it is a more serious condition than *sapraemia*, in which only the poisons produced by the germs, and not the germs themselves, circulate in the blood, and less serious than *pyaemia*, in which collections of pus, or abscesses, occur in different parts of the body.

The treatment aims at the destruction of the micro-organisms concerned, firstly by the removal, by operation if necessary, of all infected tissues at the original focus, and secondly by attacking those in the

blood-stream. The latter is carried out by doing all that is possible to stimulate the natural powers of resistance of the body by drugs, diet, and nursing; and also by the injection of vaccines.

SEPTUAGINT, *sep' tū a jint*. The oldest Greek translation of the Old Testament, probably begun in the third century B.C. in Alexandria. Its oldest existing manuscripts, the Vatican and the Sinaitic copies, are still regarded as texts of high authority.



A SEQUOIA TREE IN CALIFORNIA

The name, meaning "according to the seventy," refers to an early belief, founded on a forgery, that the translation was made in seventy-two days by seventy-two scholars, and brought by Ptolemy Philadelphus from Jerusalem. It is commonly indicated by the Roman numerals LXX. See **BIBLE**.

SEPTUM. See **NOSE**.

SEQUOIA, *se kwoi' a*. Cone-bearing tree, native to the Pacific coast of the U.S.A. Some species have attained immense age and size and are possibly the oldest living things in the world. Authorities have given the age of the finest specimens as about 7000 years. One tree is 325 ft. in height, another 94 ft. in circumference. The largest trees grow on the western slopes of the Sierra Nevada range at an altitude of 5000-7000 ft.

Scientific Name. The sequoia genus belongs to the family *Pinaceae*. The "big trees" are classified as *Sequoia gigantea*.

SERAGLIO, *se rah' yo*. A word from the Persian *serai*, meaning "old palace," used to describe the ancient residence of the Turkish sultan at Constantinople.

The word seraglio is now restricted to mean a *harem*, or suite of women's apartments.

SERAJEVO, *sa rah' yay vo*, officially SARAJEVO. See BOSNIA AND HERZEGOVINA; SERBIA.

SERAPH OR **SERAPHIM**, *ser' ra fim*. See CHERUB.

SERAPIS, *se ray' pis*. Name compounded of *Osiris* and *Apis*, and employed in Egyptian mythology to denote a deity who was introduced into Egypt by the Ptolemies and who was therefore worshipped in the Greek and Roman towns of that country. The principal shrine of Serapis was the Serapeum at Alexandria.

SERBIA. Formerly a state in the northwest of the Balkan Peninsula, but since the World War the largest portion of Yugoslavia. The Serbian territory extends from the Save-Danube line on the north to Greece on the south, and from Albania, Montenegro, and Bosnia on the west to Rumania and Bulgaria on the east.

The People. The Serbians are a branch of the Slavs, but more particularly they represent the South Slav group, whose desire to be free from Austrian rule was one of the contributory causes of the World War. The language of the Serbs is Serbo-Croatian. The Croats are generally Roman Catholics, and the Serbs of the Greek Orthodox faith.

Area and Population. Serbia began its history as a free and independent nation in 1878. It then covered most of the territory now included in North Serbia. In 1913, at the end of the second Balkan War, its area of 18,650 square miles was increased to 33,891 square miles. When the new kingdom of Yugoslavia was established, and its external and internal boundaries were defined, Serbia gained most of the Turkish territory that had been assigned to Montenegro in 1913, besides a section of Bulgarian land along the eastern frontier. When Yugoslavia was divided into nine provinces in 1929, the boundaries of Serbia were lost. Belgrade, the old capital of the Serbian kingdom, is the present capital of Yugoslavia. See YUGOSLAVIA.

History. In ancient times, Serbia formed a part of the Roman province of Moesia. At the time of the invasion of the barbarians, it was occupied in succession by Huns, Ostrogoths, Lombards, and Avars. At the invitation of the Byzantine emperors of Constantinople, the Serbs settled in this region during the seventh century. In the eleventh century, the Serbs threw off their

allegiance to Byzantine emperors and established an independent kingdom. This Serb kingdom extended its territory, and in the middle of the fourteenth century it occupied a great part of the Balkan peninsula.

Then the Turks invaded the country, and at the Battle of Kossovo (1389) defeated the Serbians so completely that Serbia remained



IN OLD SERBIA
Sinan-Pascha Mosque, Prizren
Photo Photopress

a part of the Ottoman Empire for over 400 years. Not until 1878, after many struggles, did Serbia gain freedom from Turkish rule. This result followed the Russo-Turkish War of 1877-1878.

A new era for Serbia began in 1903 with the accession to the throne of Peter I. He proved himself to be a progressive, constitutional ruler. Under his inspiration the Serbs, both in and out of Serbia proper, dreamed of a Greater Serbia that would be the homeland of those South Slavs who found the yoke of the Dual Monarchy most galling. A step toward this goal was the formation of the Balkan Alliance in 1912, when Serbia, Montenegro, Bulgaria, and Greece began a war against Turkey for the liberation of the oppressed Christians in Albania and Macedonia. This struggle ended in the complete defeat of Turkey, but a

month after the signing of the peace treaty, which occurred on 30th May, 1913, hostilities were resumed by the Bulgarians, who were dissatisfied with the distribution of the conquered Turkish territory.

This second Balkan War, in which Bulgaria was defeated by its former allies, had serious consequences. The cession to Serbia of a large portion of Macedonia at the expense of Bulgaria left a smouldering flame of resentment in Bulgaria that placed this country on the side of the Central Powers in the World War. On 28th June, in the Bosnian capital of Sarajevo, Archduke Francis Ferdinand, heir to the throne of Austria-Hungary, was assassinated by Serb fanatics, who hoped to further, by such means, the realization of their ideal of a Greater Serbia. Austria professed to believe that the act was part of a general Serbian plot to dismember the Dual Monarchy. Accordingly the Austro-Hungarian government made demands upon Serbia that it was impossible to meet without a yielding of sovereign rights, and, on 28th July, when these were rejected, declared war. See WORLD WAR.

The union of Serbia with Slovenia, Croatia, Dalmatia and Bosnia was proclaimed on 1st December, 1918, forming the Kingdom of the Serbs, Croats and Slovenes, a name which was subsequently changed to YUGOSLAVIA (which see).

SERFS. Labourers under the feudal system in Europe, who were bound by law to the land on which they lived, being transferred with it from one owner to another. The serf system of labour arose in the early Middle Ages, when, in return for their small holdings, the peasants cultivated the land of the lords and paid the latter dues on houses, cattle, etc. Serfs were a higher order than slaves and lower than vassals, who were free to go from one lord to another.

The system disappeared gradually, with other institutions of feudalism, in the later Middle Ages.

Serfdom in Imperial Russia was the last survival of this form of feudal custom. It was abolished in 1861. See FEUDAL SYSTEM.

SERGE. A textile material, usually worsted, woven in a 2½ twill weave; that is, the weft yarn passes over two warp yarns and under the next two, and so on across the fabric. A good quality serge is woven from 2 fold yarns throughout, a medium quality from 2 fold warp yarns and single weft yarns, while the cheaper are produced from single yarns in both warp and weft. Worsted serges made from yarns of merino wool are known as Botany serges. An art serge is a thick furnishing fabric woven in the 2½ twill weave from coarse crossbred woollen yarns;

the cheaper grades of art serge contain a proportion of cotton. Silk and rayon fabrics are also woven in the serge twill.

SERGEANT, *sar' jent*. A non-commissioned officer of the Army or Marines, ranking next above a corporal; his duties are to supervise the training and work of the men in barracks and in the field, under the general direction of his officers. The term also describes a police officer of superior rank. The word is derived through the French *sergent* from a Latin word *serventis*, meaning "serving."

In the British Army a sergeant ranks between a corporal and a warrant officer, class II, the regimental quartermaster-sergeant is the senior non-commissioned officer; other ranks are squadron, battery or company sergeant-major or quartermaster-sergeant, band-sergeant, sergeant drummer or drum-major, and sergeant-cook.

A *lance-sergeant* is a corporal, selected for his ability, who is appointed a temporary sergeant until a vacancy occurs on the sergeants' roll, lance-sergeant is an appointment, not a rank. See RANK.

SERICITE, *ser' ri site*. A pale-grey, silky looking mica occurring in metamorphic rocks such as schist and gneiss, and in small fibres in many other rocks derived from them. It has recently been established by Dr W. R. Jones that this hydrated silicate of aluminium and potassium, and not free silica as formerly maintained, is the chief mineral found in the lungs of miners who have been killed by silicosis.

SERJEANT-AT-ARMS. An officer appointed by a legislative body to enforce order at its meetings. The Serjeant-at-arms of the House of Commons is appointed by the King "to attend upon His Majesty's person when there is no Parliament, and at the time of every Parliament to attend upon the Speaker of the House of Commons." When the Speaker enters or leaves the House, the Serjeant-at-arms walks before him carrying the mace. It is his duty to maintain order and decorum in the House, to prevent the entry of unauthorized persons, and to give notice to committees when the House is going to prayers. When the Speaker issues a warrant for the attachment of anyone guilty of contempt of the House, the Serjeant-at-arms executes the warrant by arresting the offender. As "housekeeper of the House" the Serjeant-at-arms has control of all that part of the Palace of Westminster occupied by the House of Commons, and appoints all the minor officers and servants. The House of Lords also has a Serjeant-at-arms whose duty it is to attend upon the Lord Chancellor. Dominion Parliaments likewise have their Serjeants-at-arms.

SERJEANT-AT-LAW. From the Latin *serviens regis ad legem* (King's servant at law); a rank at the Bar which has now been abolished. Serjeants-at-law, like King's Counsel, were appointed by the Crown, and enjoyed important privileges; e.g. at one time they alone had the right of appearing before the Court of Common Pleas. See **BAR**; **HARRISTER**; **INNS OF COURT**.

SEROUS, *se' rūs*, **MEMBRANES.** See **MEMBRANES**.

SERPENTINE. A variety of rock composed of silica, magnesia and water, probably derived from the metamorphism of such basic rocks as peridotite. It ranges in colour from various shades of green to brown, yellow, and red. Most varieties are green, spotted, or streaked with black and white. Serpentine is strong, easily quarried, takes a beautiful polish, and is a valuable stone for interior finish. One of the most prolific sources of serpentine in England is the Lizard promontory, where it is worked into a large variety of ornaments by local craftsmen. The name was given this rock because of its green-mottled surface which bears some resemblance to the skins of serpents. Asbestos (which see) is a fibrous variety of serpentine.

SERUM THERAPY, *se' rum ther' ra pi*. A method of combating disease by means of serums or fluid compounds derived from blood. Serums act by neutralizing the poisonous products (toxins) of disease germs, or by killing the bacteria themselves, and are introduced either directly into the blood or as compounds. Those of the first class are said to be *antitoxic*, those of the second type are *anti-bacterial*.

Antitoxic serums are prepared as follows. The organisms of the particular disease to be controlled are grown in a fluid medium, and a filtrate is obtained by passing the fluid through a porcelain filter. This filtrate contains the toxins, or poison products, of the germs. It is injected beneath the skin of a large animal, such as a horse, through a series of inoculations, each dose being stronger than the preceding one. The animal gradually accumulates large amounts of antitoxins, or antibodies, in its blood, in order to resist the poisonous material. At the proper time, the animal is bled, and the serum is separated from the corpuscles, and strained through a filter. The antitoxic serums that have met with success are those for controlling diphtheria, lockjaw, erysipelas, scarlet fever, and snake venom. The most successful anti-bacterial serums are those used for the cure of epidemic spinal meningitis, one type of pneumonia, anthrax, and dysentery.

SERVAL. Name given a wild cat of

Africa, with a tawny, black-spotted fur. The animal is about 3 ft. long, and has a 16-in. tail. As the African native chiefs wear mantles made of serval fur, these wild cats



YOUNG SERVAL CAT
Photo: Cherry Kearton

are being threatened with extermination. They frequent undergrowth along river banks and prey on small mammals, fowl and other creatures.

Scientific Name. The serval belongs to the family *Felidae*. Its scientific name is *Felis serval*.

SERVANT. See **MASTER AND SERVANT**.

SERVETUS, MICHAEL. See **CALVIN**, JOHN.

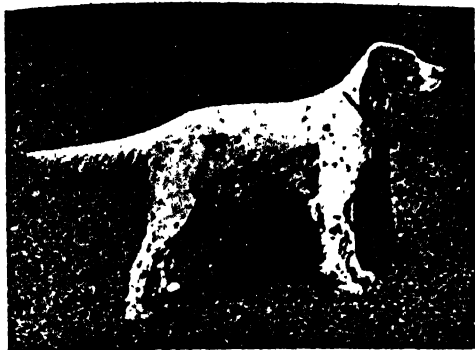
SET. Egyptian god, brother and murderer of Osiris, defeated in battle by Horus, son of Osiris. The consort of Set was the goddess Nephthys. See **OSIRIS**.

SETH. One of the sons of Adam (see **ADAM AND EVE**).

SETI I, *se' te*. A king of ancient Egypt who reigned about 1320 B.C. He invaded Palestine and Syria, but his progress in Syria was stayed by the Hittites. His fame lies in the magnificent structures which he erected or began, on some of which are sculptured accounts or representations of his conquests. The most important of these are the Hall of Columns at Karnak and the temple at Abydos. The great tomb at Thebes with its numerous chambers, which he excavated in the rock, was discovered by Belzoni in 1817, and his mummy, with that of his son Ramesses II, was found at Deir-el-Bahri in 1881.



SETI I
The head of the mummy of the king. He lived at least 3200 years ago.



ENGLISH SETTER BITCH
Photo: St Clair



SETTER ON THE ALERT
Photo: Wide World

SETTER. There are three varieties of setter—English, Irish and Gordon.

They are very elegant dogs, large but not too large, standing about 24–25 in. at the shoulder, with a jaunty (but not jerky), quick, easy movement, shoulders slightly higher than hindquarters, and neck long, muscular and lean.

The popularity of the English setter is growing rapidly, and he is claimed to be less



GORDON SETTER
Photo: Fall

excitable than the better known Irishman. He is amiable, never ferocious, easily trained both to gun and show—or merely as a companion. In colour he should be white, lightly ticked with blue, blue-and-tan, lemon or liver, free from heavy dark patches or solid colouring—indeed, the lighter the better. The coat is slightly wavy, long and silky, with feathering on tail, chest and forelegs.

The Gordon, standing 26 in., is larger than the English or the Irish setter, and in colour black-and-tan. He is the native bird dog of Scotland.

The Irish setter was known in Ireland in

the fifteenth century. The general appearance is that of a dog built for speed, of a rich golden-chestnut colour—there may be a little white on chest, throat or toes, or a small star on the forehead. The nose is dark mahogany or dark walnut in colour, eyes rich hazel or dark brown. The coat is quite free from curl or wave.

SETTLEMENT. In law, any trust under which successive interests arise; e.g. where property is held in trust for one person during his life, and after his death in trust for another person. Settlements are commonly made on marriage, with the object of providing for the wife and children after the death of the husband, many wills also constitute settlements, the testator wishing to provide for successive generations of his family. Where the settled property consists of land (with or without buildings) the provisions of the Settled Land Act, 1925, apply; the object of this Act is to insure that the person who for the time being is entitled to the enjoyment of the land (and who is known as the "tenant for life") shall always have power to sell the land. Where settled land is sold, the proceeds of sale are called "capital money." Capital money is invested in the names of trustees and is held by them on the same trusts as the land would be held if it had not been sold. See TRUST, PROPERTY, LAW OF.

SETTLEMENT, ACT OF. See WILLIAM III (England), BRITISH CONSTITUTION.

SEVASTOPOL. See CRIMEA

SEVEN BISHOPS. See JAMES II

SEVEN WEEKS WAR, THE. This war between Austria and Prussia in 1866 decided, and was fought to decide, the leadership of the German states. The actual excuse for war, long planned by Prussia under Bismarck's guidance, was a quarrel over the control of Schleswig and Holstein, which the two nations had taken from Denmark.

Austria was supported by Saxony and had

the sympathy of other German states, but was hampered by fear of Italian aid for Prussia. The Prussian troops had been splendidly organized by von Roon and were armed with the new breech-loading rifle. King William and the Princes were capable soldiers whose personalities had an admirable effect on the morale of their men, and von Moltke, the Chief of Staff, was a military genius, the first man to grasp the strategical potentialities of the railway. The Austrian and Saxon commanders were sound but uninspired textbook soldiers, who allowed the initiative to pass to their enemies. On 1st July at the Battle of Sadowa, also known as Königgratz, both sides fought splendidly but the Prussians won a great victory. Peace was made when the Prussians were at the gates of Vienna, faced by the Austrian armies assembled for a desperate resistance, and the centuries-old dominance of Austria passed to her northern rival.

SEVEN WISE MEN OF GREECE. The seven persons thus characterized were the following: Solon, Thales, Periander (or Epimenides), Bias, Pittacus, Cleobulus and Chilo. They lived in the sixth century B.C. and were famed for either philosophical or practical wisdom.

SEVEN WONDERS OF THE WORLD. A list of seven masterpieces of ancient art compiled by the epigrammatist Antipater of Sidon in the second century B.C., viz.—

- The Pyramids of Egypt
- The Hanging Gardens of Babylon.
- The Statue of Zeus at Olympia by Phidias
- The Temple of Diana at Ephesus.
- The Mausoleum at Halicarnassus.
- The Colossus of Rhodes
- The Pharos of Alexandria.

SEVEN YEARS WAR, THE (1756-1763). In the August of 1756 Frederick the Great, realizing that Austria, France, Russia, Sweden and Saxony were planning his destruction, invaded Saxony before they were prepared. Britain and France had already been engaged in unofficial hostilities both in America and India, and in that June the British navy seized many French ships. France retaliated by an expedition to Minorca. Its fall was not prevented by Admiral Byng, who considered his fleet too ill-equipped to risk battle with the French. His decision was unenterprising but probably correct. Popular indignation, however, made a political change inevitable. The Duke of Newcastle was replaced as Premier by the Duke of Devonshire, but he again became Premier in 1757 with William Pitt as Secretary of State and in control of the war.

In 1757 Frederick defeated the Austrians at Prague but was himself defeated at Kolin. French, Russian and Austrian armies ad-

vanced on Prussia and the French drove the Duke of Cumberland out of Hanover. The French were also proving the more successful in America. Pitt secured from Parliament a large subsidy for Frederick, who won great victories at Rossbach and Leuthen. Pitt's policy was so to aid him with men and money that the major French effort must be made against him, leaving Britain free to concentrate on the colonial struggle. In this year the situation in India was eased by Clive's great victory at Plassey.

The British colonists on the American seaboard were in serious danger, for the French planned to link up their Canadian and Louisianan holdings by a chain of forts along the Mississippi and Ohio. In 1758 the results of Pitt's inspiring energy and good judgment of men began to tell. Frederick crowned a brilliant campaign by the victories of Zorndorf and Hochkirch.

1759 began badly for Prussia, their troops being defeated at Kunersdorf and Maxau. This year, however, came to be known as the Year of Victories. Ferdinand of Brunswick at Minden heavily defeated the French, who were only saved from utter demoralization by the misconduct of Lord George Germain, later Viscount Sackville. See SACKVILLE. The same August Admiral Boscawen scattered off Lagos the French Toulon fleet. In November Lord Hawke destroyed the French fleet in Quiberon Bay. Meanwhile Quebec had fallen in September to General Wolfe.

Prussia was by now almost exhausted and the fierce struggle at Torgau in 1760 weakened her still further. In this year Sir Eyre Coote defeated Lally Tollendal at Wanderswash in India. 1761 saw Prussia still harder pressed. Pitt resigned, for the new king, George III, refused his plan of attacking Spain before that country could join the war on the French side. The death of Empress Elizabeth in 1762 removed Frederick's most deadly enemy, and in 1763 Britain made peace with France, which agreed to cease the attack on Prussia. The Treaty of Paris secured to Britain Canada and all French possessions east of the Mississippi, some other minor territorial adjustments were made. Prussia won peace in the Treaty of Hubertsburg, but Frederick felt resentment against Britain for the slackening of much needed support.

SEVERUS, LUCIUS SEPTIMIUS (146-211)
A Roman emperor.

From 197 to 208, he conducted a successful campaign against the Parthians, explored Egypt, and gave his attention to the organization of the empire. In 208 he went to Britain, where he penetrated into Scotland; and to guard the south from the invasions of the Highlanders, built a wall from the

Tyne to the Solway Firth. He died at York.

SEVILLE, *sevil'*. See SPAIN.

SEVRES PORCELAIN. See PORCELAIN.

SEVRES, TREATY OF. See TURKEY (History); GREECE (Modern History).

SEWAGE. The removal of waste matter and debris from urban districts is no modern development. Systems for sewage disposal are to be found in the ruins of Babylon, Jerusalem and Rome, the famous Cloaca Maxima of Rome being built as a sewer in 600 B.C. It is still in use to-day.

In London in early times most of the sewage seems to have been discharged untreated into the Thames and its tributaries, in spite of the fact that these were also the source of supply of the city's drinking water. The disastrous effect on public health of this method of disposal was shown by the great cholera epidemic of 1831 which was the cause of over 50,000 deaths in the United Kingdom. With the advent of the Industrial Revolution many new towns had sprung up, causing great congestion of population in certain areas. The bulk of the inhabitants were used to rural methods of sanitation, which were quite unsuited to town life. Consequently filth and disease were rampant. The factory owners neither knew nor cared about sanitary engineering. The better-class houses were usually provided with cesspools which were often connected to the existing rain-water drains and so added to the filth in the streets. The situation was finally taken in hand by the Government, the use of closed sewers in towns was made obligatory in 1847.

Drainage and Sewers. A sewage system implies the removal of refuse by means of water as distinct from collection in carts. Water closets, sinks, etc., are connected up to a series of drains. The connections contain a double bend which is kept filled with water in order to prevent gases from the drains penetrating into the houses. House drains are usually constructed of glazed stone-ware from 4 to 6 in. in diameter. The flow from these discharges into larger conduits built of brick, the size of which depends on whether they are designed to carry rainwater as well as the effluent from houses. In the *combined system* both rain water and sewage are carried to the sewage works in the same sewers. Difficulty is likely to be experienced after heavy rain when very large volumes of liquid would have to be dealt with. The difficulties can be lessened by arranging that part of the storm water is run off directly to the rivers by means of a device known as a storm overflow. This comes into action when the flow reaches a certain magnitude, but its

use may cause pollution of the rivers. In general it is found preferable to collect the sewage and rainwater in separate conduits.

Sewage Works. The removal of sewage from towns in sewers shifts the problem of disposal to the sewer outfall. Pollution of rivers and streams at the outfall must obviously be prevented. The earliest method of disposal was by "land filtration" at a so-called sewage farm. The sewage was allowed to flow into fields so that the water gradually drained away, leaving the sludge behind. Crops were afterwards grown on the fields. In such a system the nuisance of smell is unavoidable, and in addition the land tends to become waterlogged.

Although land filtration is still in use in some places, modern methods of sewage treatment employ tanks or special filters. The coarser particles are first removed by screens which are mechanically scraped. The finer particles may be removed by allowing the sewage to flow into "settling tanks." The fine particles gradually fall to the floor of the tank. The settling is sometimes aided by chemical treatment.

The amount of sludge formed can be reduced by allowing the sewage to stand for several days in a "septic tank." The sludge is broken up by bacterial action and dissolves in the water, forming a dark-coloured solution. Another method is the "activated sludge process" in which the sewage is purified by blowing air through the solution. Part of the sludge is coagulated by bacterial action, and this solid matter is circulated through the tank by the air stream. It has the property of promoting the purifying action of the air.

An alternative to tank treatment is the percolation filter. After preliminary removal of the coarser particles, the liquid is distributed over a filter bed of clinker, coal or sand, about 6 ft. in depth. The distribution is usually effected by rotating sprays.

The effluent from tanks or filters is tested by determining the amount of oxygen it will absorb. If the absorption is sufficiently low, the effluent is discharged into rivers or streams. Rivers have the property of self-purification, due partly to the presence of aquatic plants which give off oxygen and so destroy harmful organic matter.

Sludge Disposal. Sewage sludge has a value as manure, and in country towns it is usually disposed of to farmers, after drying. If there is no market, it may be burned in trenches or shipped out to sea. When the sewage contains particular kinds of trade waste, it is sometimes profitable to recover grease from the sludge. Another use for sludge is in the making of artificial manures.

Sanitation in Villages. In small villages the erection of a sewage disposal works would be too costly. If houses are fitted with water-closets these should be connected to tight cesspools, which should be emptied periodically and their contents spread over fields. Bleaching powder may be used as a deodorant during this operation. Leaky cesspools may contaminate nearby wells.

SEWING. The occupation of using a needle or that which is sewn by it. The fundamental stitches include: *basting*, a temporary stitch to hold material together previous to permanent stitching; *running stitch*, made by passing the needle over and under the material; *hemming stitch*, a slanting stitch used to hold a folded edge down to the material; *chain stitch*, an ornamental stitch in which the looped thread forms a chain at the edge or on the underside of the material; *slipstitching*, a modern form of hemming, more hidden but less strong; and *backstitching*, used in place of machine stitching.

SEWING MACHINE. A labour-saving mechanical device, designed to supersede hand sewing. An Englishman, named Thomas Saint, patented a wooden machine in 1790, which made a single-thread chain stitch. The thread was automatically led to the needle, which had a notch instead of an eye, and an awl made holes for the needle to pass through. This machine, however, did not give practical results. Forty years later, a Frenchman, Barthélemy Thimoniér, patented a machine that was actually used to make soldiers' garments.

Howe's machine, upon which all double-threaded models of to-day are based, had a needle with an eye near the point. A shuttle, below the cloth, carried a lower thread on a small bobbin, and the needle was fastened to an arm that vibrated on a pivot, its movement forced the needle through the cloth, producing a lock stitch. Nearly all domestic machines of to-day are of the double-thread, lock-stitch type. The lock stitch is much like weaving in formation. Of the inventors who followed Howe, A. B. Wilson and Isaac Singer deserve special mention. The former introduced the four-motion automatic feed used on nearly all modern machines, and the latter the treadle operated by foot, and a presser foot with a yielding spring, which holds the fabric down on the feed plate.

SEX. Sexual reproduction is not the only form of reproduction (see REPRODUCTION), yet it is the form common to all animals with power of recognizing objects around them and responding with movement and bodily changes.

In the lower mammals the sexual urge is strong only at definite seasons, when mat-

ing occurs; and generally no enduring bond is formed between the parents. Amongst the higher mammals—monkeys, apes and men—the reproductory capacity of the female is not confined to a single season. Her sexual attractiveness is more or less continuous and we have lasting bonds established between the parents as well as with the young.

The sexual instinct is an integral part of man's nature, and the physiological changes which take place at puberty are only evidence of its activity. Hence we have to consider forms of behaviour that are the forerunners of actual reproduction as well as some behaviour that does not lead to reproduction at all (perversions).

In the infant we can easily see how physical contacts, kissing, fondling and caressing are sought after and enjoyed. We can also see that some parts of the body, even of the youngest infant, are far more sensitive to stimulation than others. The child, again, comes to recognize those who caress him, rewarding them with his love.

Naturally, the first objects of the child's love are almost always the parents or members of his own family, and, as the love must find expression, he models it on the only pattern he has, the loving attitudes of the parents towards one another and himself. At first sight it may appear that a little girl of four, playing affectionately with her dolls is much more mature—much more a real woman—than the girl of eight or nine who has become a tomboy. In the same way the boy in the nursery who adores his mother and sisters may strike us as being nearer to the adult male in attitude than the older boy who disdains anything girlish.

As far as we can judge, this change from the nursery state to the apparent sexlessness of the large majority of boys and girls arises from the conflict which usually occurs in the child's mind at about 3 or 4 years of age.

The child, where instinct for physical pleasure demands satisfaction, still turns to his parents for it. He finds, however, that they are beginning to deny it to him and, moreover, that often when he seeks pleasures for himself, he is punished or taught to consider them wrong. The state of mind which arises is often rebellious, and dangerous to the child as a social being.

The change to boyishness occurs when the child, perceiving, at least emotionally, that his desires are futile, sublimates his instinct in the multitude of new interests in life outside the home circle which claim his interest. It is when these fail, or when he is hurt, that he returns to the home for comfort and protection.

At puberty, however, there is an awakening of the earlier attitudes and conflicts. The child turns to those of the opposite sex, but he seldom does so without qualms. Probably a great part of the conflict remains unconscious, but anxiety, rage, fear, shame and guilt may be felt only too keenly by the adolescent and are responsible for the difficulties in behaviour and mood which are so well known. Under normal circumstances these mental conflicts are allayed partly through turning emotional energy into other channels, towards learning, games and creative activities; partly through the fact that the positive impulses made possible by the individual's maturing sexuality come more and more to outweigh the negative tendencies, such as fear and shame. As this happens, the individual becomes capable of falling in love, and the degree to which it happens does much to determine the strength and permanence of his loves. Where sexual impulses, tenderness and affection and consummation, according to a form which does not cause shame and guilt, can follow in normal course his love is likely to endure; but where the negative impulses are strong he is much more likely to abandon his love object quickly.

The forms of sexuality in adults are legion, but we may get some little insight into them when we realize that they are related to the course of development of the instinct. Some stages of development prove much more difficult for some individuals than do others, and there tends to be a check at these particular points. This is known technically as fixation. It may result in the individual remaining at an early stage of development all his life, as when for example he remains permanently homosexual. Or, on the other hand, development may appear to go forward without really doing so at all completely. Then, when actual difficulty and disappointment occur, he will tend to regress to these earlier attitudes which he has been unable to give up entirely. He will react perhaps to a disappointing love affair by hating and shunning all women, adopting rather the attitude of the little boy who thinks all girls are "sloppy." Or (what is more serious) he may become abnormally wrapped up in himself and withdraw a great part of his interest from the outside world. See CHILD DEVELOPMENT; EMOTION; HEREDITY; NEUROSIS; PSYCHOANALYSIS.

SEXTANT. An instrument for measuring the angular distance between any two points, such as the sun and the horizon. It is used most commonly in determining the position of a ship at sea.

A sextant consists of a frame supporting the graduated arc of a sixth part of a circle,

a radial arm travelling over this arc, two mirrors, and a small telescope. The fixed mirror is known as the *horizon glass*, because it is trained on the horizon; the movable mirror, screwed to the head of the radial arm, or index bar, is called the *index glass*. The purpose of the telescope is to sharpen the line of the horizon. In using the sextant, the operator, holding the plane of the arc vertical, looks through the telescope at the horizon glass, which is held at the point where earth and sky seem to meet. Then he moves the index arm until the image of the sun or a star, reflected in the index glass, touches the horizon line. The sun's altitude may be read from the graduated arc, slight corrections being made for refraction and other errors.



SEXTANT

The principle underlying the use of the sextant is a rule in optics. If an object is seen by repeated reflection from two mirrors perpendicular to the same plane, the angular distance of the object from its image is double the inclination of the mirrors. In reading the graduated arc, therefore, half degrees are taken as degrees, because what is really measured on the index is the angle between the mirrors, and this is half the distance between the objects. The position of the star in the celestial sphere being known, it is possible to determine the latitude of a ship by comparing its altitude with this position.

SEYCHELLES, *say shel'* A group of 92 islands lying in the Indian Ocean 1000 miles east of Mombasa and some four to five degrees south of the equator. With some outlying dependencies, Amrantes, Aldabra, Providence and other small islands, they are a British colony. The islands are of granitic and volcanic formation, rising in Mahé to over 3000 ft. coral reefs are numerous. The total land area is 156 square miles, of which Mahé occupies 55. The climate is equable, warm and wet but tropical hurricanes do not occur. Vegetation is tropical forest, except where cleared and there are many mangrove swamps. The inhabitants are mainly negroes and half castes with some Indians and number 20,406. The white population consists mainly of people of French descent and is small. Maize, manioc,

bananas, yams and sugar are grown for local consumption; coconuts, covering 28,300 acres, are the chief commercial crop and copra is the chief export. Cinnamon, vanilla, patchouli, rubber and pineapples are also produced, and there is some export of phosphates. The coco-de-mer or double coconut is found only in the Seychelles. Victoria on Mahé is the chief port with a good harbour. Trade is chiefly with Great Britain and India.

The islands were colonized by the French in 1742 for the sake of their spices, captured by the British in 1794 and made a dependency of Mauritius in 1810. In 1888 an Administrator was appointed with certain local powers, but not until 1897 was he given full powers and not until 1903 were the islands made a separate colony. The Governor is assisted by an executive council.

SEYMOUR, *se' mor*, FAMILY OF. This noble house claims descent from the St. Maurs, settled in Monmouthshire by the thirteenth century. Sir John Seymour (d. 1536) had three children who won to high position, Edward (see SOMERSET, DUKES AND EARLS OF), Jane and Thomas. Jane, lady-in-waiting to Catherine of Aragon and Anne Boleyn, became the third wife of Henry VIII and mother of Edward VI.; she died in 1537, not long after the birth of her son. Thomas, who was created Lord Seymour of Sudeley and Lord High Admiral, was a bold and ambitious adventurer of much charm. On the death of Henry VIII, he married the wealthy Catherine Parr, and, when she died, he planned to marry the Princess Elizabeth, in whose name he would have attempted the throne. He also persuaded the Duchess of Suffolk, the King's cousin, to place her elder daughter Jane Grey in his care. He was arrested and beheaded.

Edward (died 1621), son of the Protector by his second wife, was in 1559 created Earl of Hertford. He secretly married the Lady Catherine, younger sister of Jane Grey, for this royal marriage he was fined and imprisoned for nine years, his lady dying in the Tower. Their grandson, William, in 1610 secretly married James I's cousin, Lady Arabella. They were both arrested, and both escaped, but Arabella was recaptured. During the Great Rebellion, Seymour, as Marquess of Hertford, was prominent on the Cavalier side and in 1649 offered himself for execution in place of Charles I. At the Restoration he was created Duke of Somerset, a title which has since passed to another branch of the Seymour family, the descendants of the Protector by his first wife.

SEYMOUR, JANE. Third wife of Henry VIII. See HENRY VIII.

SHACKLETON, SIR ERNEST (1874-1922). A British Antarctic explorer, born at Kilkee, Ireland. In 1901 he was appointed third lieutenant of the National Antarctic Expedition, commanded by Scott. From 1904 to 1906, he was secretary and treasurer of the Royal Scottish Geographical Society.

Shackleton organized and equipped, with the aid of friends, a British Antarctic expedition, and landed in 1908 at Erebus Island, South Victoria Land. Mount Erebus was ascended, and one of the most remarkable sledge exploits ever recorded was undertaken over the Antarctic continent. On 9th January, 1909, the party reached latitude 88° 23', a point only 97 miles from the South Pole, at an elevation of 11,600 ft. Shackleton was knighted on his return to England. Early in December, 1914, the explorer entered the ice pack in the Weddell Sea and after great hardships returned to England in the spring of 1917. He died in 1922, while on his third trip to the Antarctic. See POLAR EXPLORATION.



SIR ERNEST SHACKLETON
Photo. Brown Bros.

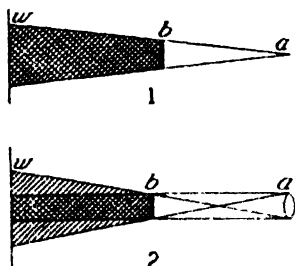
SHAD. There are two species of shad in British coastal waters. They belong to the herring family, one of them, the allis shad, being known in some parts of the country as the alewife. Both allis and thwaite shads appear off our coasts in great numbers in summer and autumn, later ascending certain rivers, notably the Severn and Shannon, to spawn. Though unfamiliar to the general public, they are excellent as food. Allied species are common on the North Atlantic coast of the United States, and in rivers such as the Ohio.

Scientific Names. The allis shad is *Clupea alosa*. The thwaite is *C. jutta*.

SHADOW. When a ray of light strikes an object, a darkened space may be seen behind the obstruction; such a space is known as a shadow. Lunar and solar eclipses are caused by the shadow of the earth and moon respectively.

The accompanying diagram illustrates the formation of shadows. In Fig. 1 the source of light is a luminous point, *a*. An

opaque body *b* intercepts the ray of light from *a*, and the space between *b* and the screen *w* is in the shadow. As the light is totally excluded, the space is completely darkened, and an *umbra* is formed. In Fig. 2, *a*, the source of light, is an area



SHADOWS

Explanation appears in the text

of considerable dimensions. In this case, the space behind *b* consists of a totally darkened region, or *umbra*, and of a region where only part of the light is cut off. This latter section, illustrated by oblique shading, is the *penumbra*. See LIGHT, ECLIPSE.

SHADWELL, THOMAS (1642?-1692) Thomas Shadwell was appointed Dryden's successor as poet laureate when Dryden lost the laureateship at the Revolution.

As a dramatist, Shadwell openly declared himself a disciple of Ben Jonson. He wrote several plays, e.g. *Epsom Wells* (1672), *The Square of Alsatia* (1688), and *The Scourers* (1691), which are comedies of "humour," and which have considerable merit as vivid pictures of the life (especially the low life) of Shadwell's time.

Dryden has given him an unenviable immortality in his satirical poems *Mac-Ilknoch* (1682) and *Absalom and Achitophel*.

SHAFTESBURY, EARLS OF. Two members of this family achieved eminence.

Anthony Ashley Cooper, FIRST EARL (1621-1683). An English statesman who forced the passage of the Habeas Corpus Act through Parliament in 1679. Born at Wimborne in Dorsetshire, he was educated at Exeter College, Oxford, and at Lincoln's Inn. In his nineteenth year he entered Parliament as one of the members for Tewkesbury and showed an inclination to side with the royalists. Afterwards, however, he became one of the most decided supporters of Parliament.

He became a member of Cromwell's Council of State during the Protectorate, but favoured the Restoration and served on the Commission sent to Breda to summon Prince Charles to the throne. Charles II

made him Chancellor of the Exchequer and raised him to the Peerage as Baron Ashley. Shortly after he was made Earl of Shaftesbury and Lord Chancellor.

Shaftesbury became one of the members of the Cabal Ministry which succeeded that of Clarendon. He supported the Test Acts, negotiated the open Treaty of Dover in 1670, and was largely responsible for the disgraceful anti-Catholic agitation which followed upon Titus Oates' plot. He is regarded as the founder of the Whig Party and led the movement in support of the Exclusion Bill which was to keep James, Duke of York, the Catholic brother of Charles II, from the throne and make the way clear for the succession of the Protestant Duke of Monmouth. Shaftesbury was seized and committed to the Tower for treason, but acquitted. In 1682, broken in health and fortune, he sought safety in Holland.

Shaftesbury was a friend of Locke, and shared with him his philosophical belief in religious toleration, but was too self-seeking a politician to follow any principle but expediency.

Anthony Ashley Cooper, SEVENTH EARL (1801-85), social reformer and Whig philanthropist. He was educated at Harrow and Christ Church, Oxford. Entered Parliament for Woodstock in 1829 and sat in the House of Commons until 1846. He succeeded to the Earldom in 1851. An opponent of *laissez faire*, he was active in all ameliorative movements of the Victorian Era, including the reform of the Poor Law, the improvement of factory conditions, the limitation of working hours (Ten Hours Bill), the care of lunatics, and the advancement of popular education, housing of the poor, and public sanitation. He supported many societies such as the Young Men's Christian Association, and was a generous promoter of the Mechanics' Institutes.

SHAG. A sea bird similar and closely related to the cormorant. The shag is smaller and the plumage in the breeding season has a glossy green sheen. In fact, it is sometimes called the green cormorant.

Scientific Name. *Phalacrocorax graculus*



LORD SHAFTESBURY
Photo. Brown Bros.

SHAGREEN, *shag reen'*. The skin of the shark or dogfish (which see).

SHAH JEHAN, *je hahn'* (1592-1666). The fifth ruler of the Mogul (or Mongol) Empire of India and the builder of the Taj Mahal, a tomb for the emperor's favourite wife. During his reign, Mohammedan architecture in India reached its highest glory. He founded the modern city of Delhi and built the Pearl Mosque at Agra, where the Taj Mahal also is situated. Shah Jehan's reign of thirty years (1628-1658) was turbulent, and eight years before his death, he was deposed by two of his sons.

SHAKESPEARE, WILLIAM (1564-1616). Of Shakespeare's life, comparatively little is known, for his own age did not regard him as a supreme genius, and made no attempt to

keep the record of his savings and doings. He was born at Stratford-on-Avon, Warwickshire, in April, 1564. The exact date of his birth is unknown, but since it was customary to baptize babies when they were three days old, and he was baptized on 26th April, there is reason for regarding 23rd April as his probable birthday. His father, John Shakespeare, was a



SHAKESPEARE

glover, but he seems also to have carried on a prosperous trade in meat, leather, corn, and other agricultural produce, his mother, Mary Arden, was a farmer's daughter of Wilmore.

Stratford and London. He was the third child and eldest son in a family of four sons and four daughters. Since his father was well-to-do, it is probable that the boy attended, between the ages of 7 and 14, the grammar school of Stratford. It seems likely that, when William was about 14, his father lost his property and also his official position in the town council of Stratford, and that the boy had to leave school. Yet at the age of 18 he married Anne Hathaway, a woman eight years older than himself. A daughter, Susanna, was born to them in the next year (1583), and two years later, twin children were christened Hamnet and Judith.

In 1585, or thereabouts, Shakespeare left Stratford, without taking his family with him. It is supposed that, still a youth of 21 or under, he got into difficulty with Sir

Thomas Lucy, a local magnate, by reason of some pranks, and felt it safest to leave. However that may be, it is certain that in time he drifted to London, where he joined himself to a company of players. What he did at the outset is not known—probably he served in some very minor capacity, and only later began to act unimportant parts.

In 1592 appeared a reference to him in a pamphlet by Robert Greene, a popular playwright—a spiteful reference which shows that Shakespeare had become successful enough as an adapter and writer of plays to rouse envy. The years that followed brought him honour, the friendship of such men as the learned Ben Jonson and the Earl of Southampton, and a considerable measure of financial success.

In 1597 he bought New Place, the finest house in Stratford, and some time later, he added to his estate a considerable tract of farm land. His visits to his native town became more and more numerous, and about 1611 he left London permanently, and retired to Stratford.

The remainder of his life passed quietly with his family, and, so far as can be known, he wrote no more plays. In January, 1616, he made his will, in which he left to his wife the "second best bed, with the furniture." This curious bequest may by no means be taken to mean that his wife was not provided for, as by law she would have dower rights in his property. He died on 23rd April, 1616, and was buried in the chancel of Stratford church.

The celebrated dramatist Jonson wrote enthusiastically of him—

"I loved the man and do honour to his memory, on this side idolatry, as much as any. He was indeed honest, and of an open and free nature, had an excellent phantasy, brave notions, and gentle expressions."

The Poems. His non-dramatic works were of two kinds—narrative poems and sonnets—and these were in his own day looked upon as of greater value than his dramas. The judgment succeeding generations have by no means confirmed, but the narrative poems, *Venus and Adonis* and *The Rape of Lucrece*, do indeed show much youthful imagination.

His sonnets, of which there are one hundred and fifty-four, rank very high in sonnet literature. Few writers have dealt with love in a more masterly manner, or have clothed their thoughts in more exquisite phrases.

The Dramas. The simplest method of classification of these is a division of them into comedies, historical plays, and tragedies. The Shakespeare critic, however, prefers to adopt a method based on chronology, because such a grouping shows the development

of creative power. In Shakespeare's work, thus considered, four periods stand out, which may be outlined as follows—

First Period (1588-1595). This was a period of experimentation and of comparative inexperience. The exuberance of imagination is evident, but the sure touch in character-drawing is absent, the plots are loosely constructed, and rhymed couplets often appear. To this period belong *Lulus Andronicus* and the three parts of *Henry VI*, which are not entirely the work of Shakespeare; *Love's Labour's Lost*, *The Two Gentlemen of Verona*, *The Comedy of Errors*, *Richard III*, *Romeo and Juliet*, and *A Midsummer Night's Dream*. It will be seen that all three types of plays are represented in this list.

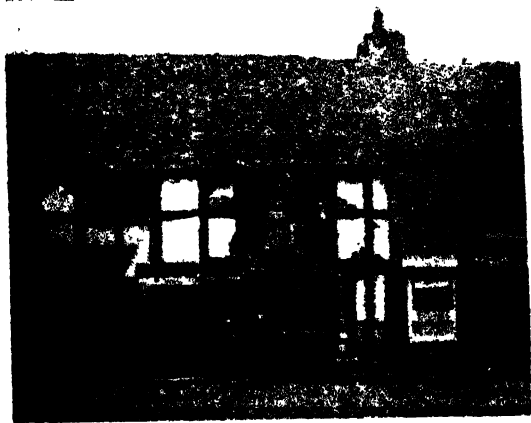
Second Period (1595-1600). Increased sureness of touch is noticeable in the works of this period, which also show a growing knowledge of human nature and a consequent lessening of artificiality. The plays which are usually assigned to this period are *Henry IV*, *Richard II*, *King John*, *Henry V*, *The Merry Wives of Windsor*, *The Merchant of Venice*, *The Taming of the Shrew*, *Much Ado About Nothing*, *As You Like It*, *Twelfth Night*, and *Julius Caesar*. That is, in these five years, he produced many of his greatest historical plays, one powerful tragedy, and a group of the most delightful comedies which he or any other writer ever wrote.

Third Period (1601-1608) This was the period of the great tragedies. The plays belonging to it mark the very summit of the poet's powers, and include the masterpieces *Hamlet*, *Othello*, *Macbeth*, *King Lear*, *Antony and Cleopatra*, and *Coriolanus*. There were comedies, too, so called, but they deserve the name only because they have no tragic ending; for *All's Well That Ends Well*, *Measure for Measure*, and *Troilus and Cressida* are, to the full, as dark and as bitter as the tragedies.

Fourth Period (1608-1611) The plays of this final period were *The Tempest*, *The Winter's Tale*, and *Cymbeline*. They are not considered the greatest of Shakespeare's plays—in some respects, they show a falling off in his powers; but they are wonderfully pleasing in their genial, benignant attitude toward human nature.

Shakespeare did not invent his plots, but took them from any old chronicle, romance,

play, or biography that contained the proper dramatic elements. Thus Holinshed's *Chronicles of England, Scotland, and Ireland* furnished him with the material for *Macbeth* and *King Lear*, Plutarch's *Lives* was the source of *Julius Caesar* and *Antony and Cleopatra*, some old Italian romances were the basis of *Romeo and Juliet*, and a popular account of an actual shipwreck led to the



ANNE HATHAWAY'S COTTAGE, STRATFORD
SHAKESPEARE'S HOUSE AT STRATFORD-UPON-AVON, ENGLAND
This photograph was taken before the house was restored.
PLATE OPPOSITE

writing of *The Tempest*. But he did not merely borrow, he re-created. To the old, lifeless, dry-as-dust tales, he gave a new vitality.

It was the very excellence of Shakespeare's work which led certain writers about the middle of the nineteenth century, to advance the theory that he was not really the author of the plays that were credited to him. A comparatively uneducated man could not, they argued, have produced works displaying such learning. For the most part, those who denied Shakespeare's authorship fixed

upon Francis Bacon as the real author of the plays, and supported their theory by means of some mysterious ciphers which they believed themselves to have discovered in the plays. Up to the present day, the controversy has raged, and some very intelligent men have supported the Bacon claim; but practically every scholar who has been trained to judgment on such questions has rejected the evidence of the Baconians.

SHALE. A sedimentary rock having a laminated structure, and containing a large proportion of alumina. Shale was deposited on the bottoms of lakes and other bodies of water in prehistoric time, and when the water was drained off, it hardened into rock. Under heat and pressure, shale in some localities has been changed to slate (see **METAMORPHISM**). Shale is one of the most common rocks of the coal measures, and it often contains fossils of the plants of the coal period. Bituminous shale burns with a flame; some bituminous shales contain petroleum, which is extracted by distillation. Shale is used to make Portland cement, is frequently ground up to make material for bricks, and is sometimes utilized as a road-building material. Alum shale is a source of alum (which see).

SHALLOT, *sha lot'*. Bulbous rooted plants of the lily family; they are cultivated for the bulbs which are pickled. Propagation is either by offsets from a bulb or by seed. If the former method is used, the bulb should be planted in spring and it will be ready for uprooting and drying off about August, when the stems begin to die down.

SHALMANESER, *shal manne' zer*. See **JEHU**.

SHAMANISM, *shak' man iz'm*. A religion practised by primitive peoples, based on the belief that the *shaman*, or witch doctor, can exorcise demons and spirits, and so ward off evil. The ceremonies consist of feasts, dances, sorceries, etc., treatment in the case of the sick often being combined with the giving of medicinal herbs.

SHAMROCK. The national emblem of Ireland, it is usually identified with the yellow trefoil. A sprig is worn by Irishmen on 17th March, St. Patrick's Day, for he it was who used the triple leaf of the shamrock to illustrate to the heathen Irish chiefs the mystery of the Trinity of Persons in One God.

SHANGHAI, *shang' hi*. China's greatest commercial port. It is situated close to the sea on the Whangpoo River, in the delta of the Yangtze. Kiangsu province, in which the city lies, has a population (estimated) of 35,000,000, about 900 persons to each of its 38,610 square miles.

The Greater Municipality of Shanghai is administered solely by Chinese; the International Settlement jointly by foreigners and Chinese; and the French Concession (or Settlement) by the French Consul-General. The population of the Chinese Municipality is 1,902,760; of the International Settlement, 1,148,800; and of the French Concession, 498,000. Of these totals, 10,500 in the Chinese area, 48,300 in the Settlement, and 18,900 in the Concession—a grand total of about 77,700 out of 3,550,376 (1934)—are foreigners. Of the foreigners, nearly 17,000 were Japanese prior to the bombardment of the Chapei area in January, 1932. About 8500 are British, 3000 Americans, 7500 Russians, 1400 French, and 1400 Germans.

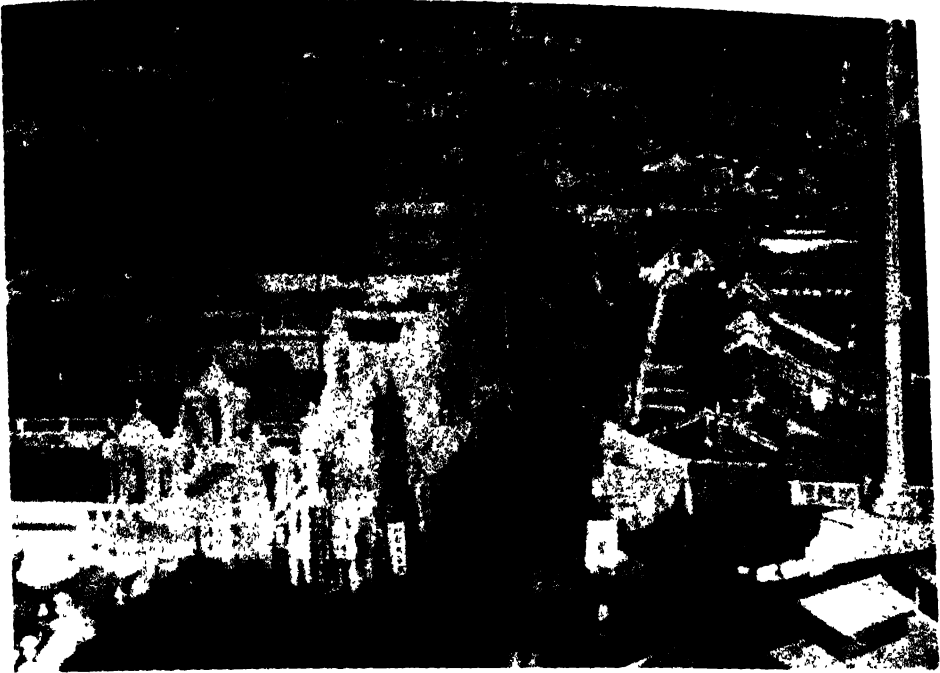
The International Settlement was created as a British Settlement under Regulations of 1845. In 1863 a similar American area to the north and east was joined with the British. In 1890 the Settlement was extended to a total of 8½ square miles. The French concession covers 3.74 square miles. In addition, foreign jurisdiction extends over certain "External Roads Areas," covering 12.4 square miles. Chinese sovereignty is not surrendered, though actual administration of the foreign area is controlled by foreigners.

Industrially, the city is notable for its two and a quarter million cotton spindles, its sixty-six silk filatures, its fifty-five engineering works, and its five shipyards.

Shanghai became the focus of world interest when, on 28th January, 1932, Japanese marines sought to occupy Chapei, a section of the Chinese Municipality, as a gesture to terminate a boycott induced by difficulties in Manchuria. Severe fighting ensued. See **CHINA**.

SHANGHAI, *shang' hi*. A word meaning to place a person on board ship, as a member of the crew, against his will. It was derived from the methods adopted by certain low-class establishments in Shanghai, which furnished crews for unpopular ships—at a price. Men were doped with drink or drugs, or knocked unconscious, and were placed upon ships, which sailed before the victims recovered.

SHANNON, *River*. The principal waterway of Ireland and the longest river in the United Kingdom, which flows with sluggish current for about 250 miles. It rises at the base of Mount Cuilcagh, in county Cavan, and flows in a south-westerly direction through a series of beautiful lakes, or loughs, emptying into the Atlantic Ocean between Loop and Kerry headlands. The Shannon power station at Ardacrusha provides hydro-electric power for the whole of the Irish Free State.



MODERN SHANGHAI

Scene in the Nanking Road near the Astor Hotel.

Photo: Norddeutscher Lloyd

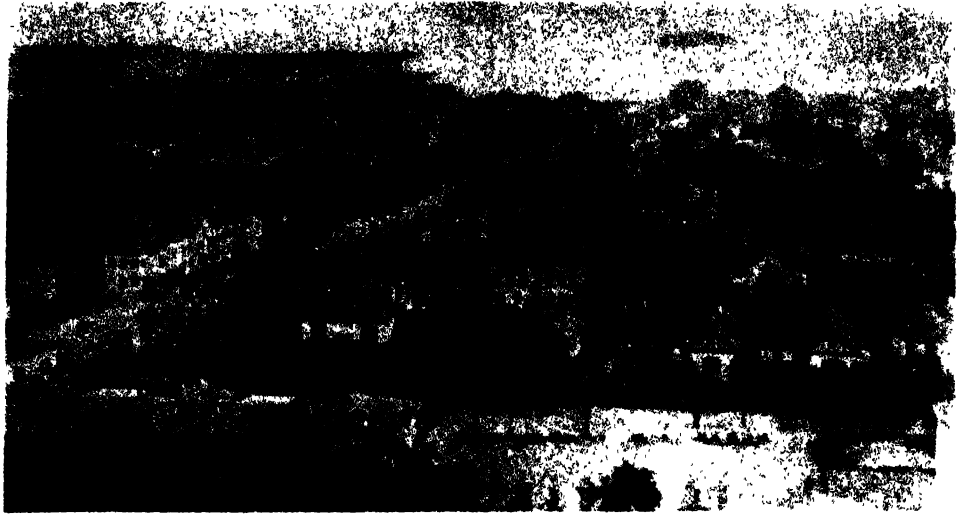
SHAN STATES. Part of British Burma, they lie in the mountainous east of the country and have an area of 62,335 sq. miles and a relatively meagre population. East of the gorge of the Salwin River the country is mainly unadministered. Agriculture is the chief pursuit, maize, millet and hill rice being grown. Lead and silver are mined. Old trade routes between Burma and China cross the area and two railways now link it with the Burmese trunk line. Each little state has a village capital, and Maymyo, the hot-weather seat of the government of Burma, is in the Shan States.

SHANTUNG, shan toong'. One of the coastal provinces of the Chinese Republic, including a mountainous peninsula projecting eastward into the Yellow Sea. Shantung province is one of the most densely populated spots in China. Within an area of 55,970 square miles, there are about 30,000,000 people. In 1897 Germany seized its ports, Kiao-chow and Taing-tao, in compensation for murders of missionaries, and strongly fortifying, developing, and improving the lease, intended never to relinquish them. In 1914 they were captured by British and Japanese forces, and turned over to Japan for administration, on the understanding

that they should be returned to the Chinese government at the close of the war. The next year Japan forced China to agree to accept any settlement reached at the peace conference, regarding Germany's political and economic rights in Shantung. China's objection to Japanese control of the peninsula was one of the problems of the Versailles Peace Conference in 1919, at which time Japan's possession was confirmed. The Chinese refused to sign the treaty and initiated an anti-Japanese boycott in China. In 1922-1923 Japan was induced to return the concessions and leases to China. See CHINA.

Coal and iron are mined. Among the greatest sources of wealth are pongee silk and "Shantung" silk, the latter made from so-called "wild silk," the product of silkworms that are fed on oak leaves in places where the mulberry does not thrive. Agriculture is the principal occupation, and the chief products are millet, maize, barley, sorghum, beans, peas, cotton, and tobacco. Oil from soya beans has become a valuable export. Glass work, pottery-making, mining, and paper and cotton manufacture are other industries.

SHARES AND STOCK. A share or stock means a division of, or an interest in, a loan



TSING-TAO, A GERMAN-BUILT PORT ON KIAO-CHOW BAY, SHANTUNG PROVINCE

Photo: P. & A.

or undertaking launched for a particular object. The capital of a company limited by shares registered under the Companies Act, 1929 (or similar legislation in countries outside Great Britain), is divided into shares or stock and held by shareholders or stockholders. The maximum amount which a company is empowered to raise by the issue of shares is called the nominal or authorized capital. Stock cannot be issued by a British company in the first instance. It can only be the result of conversion of fully paid-up shares.

On the formation of a public company, a prospectus is issued offering a certain number of shares to the public. A person wishing to take up shares fills in the application form and forwards his deposit (say 5s for each £1 share) to the company's bankers or other given address. If all the shares are allotted by the directors (or only some of them, if the issue was over-subscribed), either the remainder of the price or a further instalment will be payable. When the shares have been paid for, a share certificate will be issued to the shareholder. Each share has a distinguishing number, and may be sold and transferred to another person, subject to the regulations of the company. A portion of a share, however, may not be transferred. In the case of stock, however, there are no distinguishing numbers and portions may be transferred, e.g. such an amount as £72 10s. of a holding of £100 stock may be transferred, if allowed by the articles of association of the company. The points just mentioned, with the addition of the fact that stock

must be fully paid-up whereas shares may be only partly paid, show the difference between shares and stock.

Stocks and shares may be bought and sold as other "commodities," and for dealings in such holdings in companies' capital, stock exchanges have been established. See STOCK EXCHANGE.

Shares may be divided into different classes, the main divisions being: ordinary, preference, and deferred. Ordinary shares receive no preference in the division of profits, etc. The holders of preference shares rank before the ordinary shareholders in regard to dividends and, as a rule, to repayment of capital in the event of the winding up of the company. In the case of 5 per cent preference shares, for example, the holders of these would be entitled to 5 per cent dividend before the holders of the ordinary shares received anything. The latter may obtain a greater or less rate of dividend than the preference shareholders. It will be obvious, therefore, that the preference shares of a company are a safer investment than the ordinary shares; but the latter alone receive the benefit of a company's exceptional prosperity. If the preference shares are cumulative, any arrears of dividend which the profits are insufficient to meet in any year, accumulate and are payable out of future profits. Deferred shares rank after ordinary shares, and receive their dividend after the latter have received an agreed percentage.

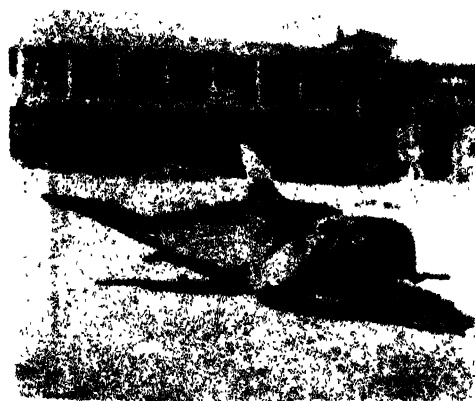
SHARK. A flesh-eating deep-sea fish found in every ocean, but most abundantly

in warm regions. Their rounded, tapering bodies, which sometimes reach a length of 40 ft. or more, have no scales, but are covered with rough, horny skin, commercially called *shagreen*. This is sometimes used in place of sandpaper, for polishing wood



HEAD OF A MAKO SHARK
Photo: U. & U.

of fine grain. The mouth, because of the elongated snout, is on the under side of the head. In some species, there are rows of sharp teeth, all but one of which are folded back on the jaws. As each tooth wears out, another grows to take its place. Other species have broad, flat teeth, and, in a few varieties, they are small. The gills of sharks communicate with the surface by several



SHARK
This specimen is 18 ft. in length.
Photo: U. & U.

openings, and these are on the sides of the body. The tail is generally unequally notched.

The largest species is the *whale shark*, often over 50 ft. long. Next in size is the harmless *basking shark*, found chiefly in the Arctic

Ocean, and so called because it is known to bask in the sun on the surface of the water. One of the best-known species is the *white shark*, a man-eater living in tropical seas. The *blue shark*, named from its colour, will also attack man.

Some of the sharks are called *hammerheads* because the head is shaped like a hammer, with the eyes at either end. Among many other species are the *dusky*, *porbeagle*, *spinous*, *tiger*, and *dog* sharks. There are a number of families of sharks, all of which belong to the same order, the *Selachii*.

The shark is the raw material of several industries. The heads are worked up into glue; the flesh makes a good fertilizer; leather is manufactured from their hides, and "cod-liver" oil from their livers. The flesh of some species of shark is used as food; dried shark fins are considered a great delicacy in China.

SHATT-EL-ARAB, *shaht el ah rahb'* See EUPHRATES, RIVER; TIGRIS, RIVER.

SHAW (GEORGE) BERNARD (born 1856). An Irish dramatist, novelist, and critic, born at Dublin. He attended school in his native

city, but his education was not very extensive, for by his fifteenth year he had begun to earn his own living. In 1876 he went with his family to London, where he did office work of various kinds, until able to support himself by literary work. Shaw was much interested in socialism, and used his talents in every way possible to advance it, speak-



BERNARD SHAW

ing on street corners and contributing articles to magazines. He developed into one of the foremost debaters in England, and was an active member of the Fabian Society. He made socialism the central theme of his early novels—*The Irrational Knot*, *Love Among the Artists*, *Cashel Byron's Profession*, and *An Unsocial Socialist*; they met with only a fair reception, but his dramatic and musical articles for various London journals had a large following, and his defence of Ibsen and of Wagner in *The Quintessence of Ibsen* and *The Perfect Wagnerite* attracted wide attention. In 1928 he published *The Intelligent Woman's Guide to Socialism*, a summary of his views. *Adventures of the Black Girl in Her Search for God* is a satiric fable about religion.

It is as a dramatist, however, that he is most celebrated, and he has had a marked influence on the European theatre. His first play, *Widowers' Houses*, was produced in 1893. It was followed by a series of dramas distinguished for wit and pungent satire, and usually as effective when read as when presented on the stage. They include *Mrs. Warren's Profession*, *The Philanderer*, *Arms and the Man*, *You Never Can Tell*, *Candida*, *The Devil's Disciple*, *Caesar and Cleopatra*, *Man and Superman*, *Major Barbara*, *The Shewing-Up of Blanco Posnet*, *Fanny's First Play*, *Androcles and the Lion*, *Heartbreak House*, *Back to Methuselah*, *Saint Joan*, *The Apple Cart*, and *Too True to Be Good*. Shaw's plays have a universal application, which keeps them from seeming out of date; they are plays of ideas, rather than of manners and customs, and they owe much of their reputation to highly independent opinions, and to his ability to express those memorably and unconventionally in the dialogue of his characters.

SHEARWATER. The familiar name of a group of sea-birds belonging to a large family, the others being petrels and fulmars (which see). The name is apparently derived from their habit of skimming low over the water. Shearwaters are found in most seas of the world. They vary considerably in size and colour, but all are more or less dusky with white patches. The bill is fairly

long and hooked at the tip, and the openings of the nose are at the end of a long tube.

Shearwaters live on the open sea, their food consisting of sea life found near the surface. They return to land to breed in large colonies. A rough nest is made in a burrow in the ground and a single white egg is laid.

A common British species is the Manx shearwater which breeds mainly on the west coast of Britain from the Shetland to the Scilly Islands.

Scientific Name. The shearwaters are in the order *Tubinares*. The Manx shearwater is *Puffinus puffinus*.

SHEBA, QUEEN OF. See ETHIOPIA; SOLOMON.

SHEEP. An animal known to have been first domesticated in prehistoric times.

The wild sheep is still found in the mountains of the northern hemisphere. It is high-spirited and self-reliant, braving the fiercest storms of winter and capable of climbing to precipitous heights that no other animals but mountain goats can ascend. Ordinarily, however, sheep prefer the slopes and open spaces in the mountains rather than the cliffs, and, like the domesticated breeds, they run together in bands, each flock having its selected leader. Under domestication, some breeds have adapted themselves to life in the lowlands, but sheep are typically mountain animals.



STUD MERINO FLOCK IN AUSTRALIA
Photo: Australian Trade Publicity

In appearance, wild sheep greatly resemble wild goats, and some species are thought to be intermediate between the two groups. Generally speaking, sheep lack the beard found on the chin of the male goat. Most sheep possess a gland between the two middle toes, which typical goats lack. The horns of the male sheep, which is called a ram, usually curve outward.

The domesticated animals are radically different from their wild progenitors. The coarse hair that covers the wild sheep is replaced by a soft coat of wool by selective breeding, and the horns have in most cases disappeared. In some breeds, however, both rams and ewes, i.e. females, are horned; in others, the rams alone.

The lofty plateau and mountain region of Central Asia is supposed to be the original home of the sheep tribe. The Altai Mountains of Siberia and Mongolia harbour the largest of all wild sheep, the argali. The male stands 4 ft. high at the shoulders, and his massive horns curve into a spiral 20 in. in circumference. On the plateau of Pamir, at an elevation of three miles, lives the great Marco Polo sheep, first described by that enterprising traveller. Little smaller than the argali, the Marco Polo is remarkable for the enormous spread of its horns. Tibet is the

Sardinia is the only wild sheep now found in Europe.

Domestication and Uses. The history of cross-breeding and selection is a long one. Some authorities trace our present breeds to the argali and the mouflon. Sheep very early



BARBARY SHEEP
Photo - Wide World

became important for their fleece, which has attained its present qualities as a result of adaptation to climate, and scientific breeding. In the writings of the ancient Romans, there are references to the manufacture of woollen cloth, but the improvement of sheep for the production of lamb and mutton is a matter of comparatively recent date. Only in the last two centuries have breeders developed animals of a distinctly mutton type. According to the character of the fleece, sheep are classified under three types, namely, long-woolled, medium-woolled, and fine-woolled. Besides wool, meat, and leather, which is made from the hide, sheep yield various by-products such as glue, tallow, suet, soap, fertilizer, and catgut.

Important Domestic Breeds. The Spanish Merino, which was developed in its native country centuries ago, is the basis of the fine-woolled breeds. They have a fine dense wool down to the toes and end of the nose. The rams usually have horns.

Another breed descended from the Spanish Merino is the Rambouillet, it was developed in France. They have long fleeces and good mutton conformation.

England is the native home of three important long-woolled breeds—the Lincoln, Leicester, and Cotswold. Lincoln sheep have become popular on ranges in various parts of the world, including Australia, Argentina, and the Western United States. They are among the largest of domesticated sheep, and produce the longest fleece. The Leicester sheep is the progenitor of most of the other long-woolled breeds.



ROCKY MOUNTAIN BIGHORN
Photo - U. & U.

home of the blue sheep, or bharal, which is closely allied to the goats. Asia possesses half a dozen other forms of wild sheep, and North Africa has one in the aoudad, a goat-like species with long hair on the breast and forelegs. The mouflon of Corsica and

The leading mutton breeds are the Shropshire, Southdown, Hampshire Down, and Dorset Horn, all of English origin. The Shropshire combines good quality of fleece with superior mutton production. The wool clothes the whole body, forming a cap over the head. Shropshires are widely distributed over the world. The Southdown, which originated in the South Downs, Sussex, produces a high grade of lamb and mutton, but it is of no great size and has a light yield of wool. It is a good sheep for small flocks on general farms.

The Dorset Horn breed is notable in that both rams and ewes are horned. Dorset Horns are white-faced sheep of distinctly mutton type, with wool of medium length.

The Hampshire Down, which is distinguished by the dark colouring of the face, ears, and legs, is a large mutton sheep that has been developed by crossing with Southdowns.

The leading sheep-raising countries are Australia and Russia, Australia having some 115,000,000. The United States, Argentina, India, South Africa and New Zealand rank next in order of production.

Classification. Sheep belong to the order *Ungulata*, or hoofed mammals, and to the family *Bovidae*, or hollow-horned ruminants (cud-chewers). They are grouped with goats in the sub-family *Caprinae*. Domesticated sheep and most of the wild species are placed in the genus *Ovis*, the domesticated species being called *Ovis aries*.

SHEEPDOG. See ALSATIAN; OLD ENGLISH SHEEPDOG.

SHEFFIELD. The city of Sheffield is in the middle of the great manufacturing area which stretches across England from the Yorkshire to the Lancashire coast, and has a population of 511,742. It is served by the main lines of the L.M.S. and L.N.E. railways, being 34 miles from Derby and about 150 from London, and has excellent road and canal transport facilities. The name of Sheffield is known the world over for iron and steel and their products, especially cutlery and electro-plate, but the city has many other industries besides these, including the manufacture of jams, polish, oils, ropes, spectacles, sweets, etc. These industries have the advantage of the proximity of the important coalfields of south Yorkshire, north Derbyshire, and Nottinghamshire. Sheffield has many relics of feudal times, and associations with Mary Queen of Scots and Robin Hood, but it is chiefly since the beginning of the steel age about 1750 that the city has been well known. Stainless steel was discovered in 1914. Sheffield has many large parks, museums, and art galleries. The University (Charter, 1905) has degree courses in Arts, Pure Science, Medicine, Dental Surgery, Law, Engineering, Mining,

Fuel Technology, Glass Technology, and Metallurgy. Sheffield Cathedral (until 1913 a parish church) is on the site of a twelfth-century building.

SHEIK, sheek. An Arabic title, used very loosely, but always meaning a venerable, aged man, or a chieftain. It may be the term applied to the head man of a village, the chief of a tribe, the leader of a religious order, or simply a person who is old and highly respected; its use down to this day is restricted, as it was centuries ago, to the Arabs and to their religion, Mohammedanism.

SHEK'EL. A word which originally indicated a unit of weight, though later it referred as well to a coin. As a weight, it was first employed in Babylonia, but its use spread to the Phoenicians and the Hebrews, each of whom modified its value. The Hebrew shekel, to which references are most common, weighed about 168 grains. Intrinsically, the Hebrew gold shekel was worth about £2, the silver about two-and-ninety pence, though the purchasing power was far in advance of such sums to-day. Before any Hebrew coins were minted, the shekel was used as a medium of exchange, uncoined ingots of gold or silver of known weight being employed.

The earliest silver shekels, which weighed about 224 grains were, until recently thought by numismatists to have been struck by the Jews in the second century B.C. Upon one side was the representation of a chalice, probably a pot of manna, with words whose English equivalent were *Shekel of Israel*, while on the other was the legend *Jerusalem the Holy*, surrounding a flower device, presumably Aaron's rod that budded. Recent researches seem to have proved that, up to and including the time of Christ, the Jews coined only copper money, and were dependent for their silver on foreign sources, and that these silver coins were struck during the revolt of the Jews in the time of Nero. Half shekels were also coined.

SHELD-DUCK, or SHELDRAKE. A resident British duck common in river estuaries. The nest is made very deep in a burrow. This is a fairly large black-and-white duck with a red bill, which in the breeding male has a distinct knob at its base. See DUCK.

SHELF, CONTINENTAL. See OCEAN

SHELL. The hard covering of the bodies of such creatures as the molluscs, the typical shell-builders. Their shells are found not only along the ocean borders, and in the sands of the lake shores, but in low inland plains, in swamps, and even on high mountains. The fleshy covering of the body, or mantle, secretes lime from the water, and layer by layer the limy substance is added



TYPES OF SHELL

1. Tower shell. 2. *Pleurotomaria Adansoniana*. 3. *Trochus Magus*. 4. *Conus Carinatus*. 5. Scallop (*Pecten Maximus*). 6. *Cymbium Olla*. 7. Limpet (*Patella Vulgaris*). 8. *Nassa Costellifera*. 9. *Helicina Major*. 10. Whelk (*Buccinum Undatum*). 11. Staircase Wentletrap (*Scalania Pretiosa*). 12. Periwinkle (*Litorina Litorea*). 13. Imperial Harp-shell (*Harpa Imperialis*). 14. Common Razor shell (*Solen Vagina*). 15. Cone shell (*Conus Cyltospira*). 16. Cockle (*Cardium Edule*). 17. Tiger Cowry. 18. Mussel (*Mytilus Edulis*).

to the growing shell. The latter is protected from the corrosive action of acids in the water by a horny, outer skin and a pearly lining. The shells of molluscs are divided into two classes—the *univalve*, or those of one piece, and the *bivalve*, those consisting of two parts joined by a hinge.

Of the first class, the spiral or wheel-like shells of the snails are most common. The single-piece shells include also the rose-lipped covering of the conch, the cowrie shells, the long spindle shells of the warm waters of the Pacific shores, and the trumpet shells and giant whelks of the Atlantic.

Clam, cockle, and oyster shells are common bivalve shells. Though the coats of crabs and lobsters are commonly called shells, these creatures do not secrete limy coverings. Their tough, hard crusts are composed of chitin.

Uses of Shell. Buttons, buckles, knife handles, and many other articles are made from the pearly lining of the oyster shell. Mother-of-pearl is also extensively used for inlaying fancy boxes, musical instruments, furniture and wall panels, and as a covering for opera glasses. Burned shells are a source of lime.

Pulverized conch shells are used in the manufacture of porcelain, and many of the large and beautiful varieties are prized as ornaments. In Africa and India, the small cowries furnish a ready-made currency,



SHELLEY'S COTTAGE, LYNMOUTH
Photo Frith

requiring only to be strung. They were until recently the only currency of the natives of the Sudan. A scallop shell worn by the pilgrims of the Middle Ages, to show they had crossed the sea to the Holy Land, came to be known as *pilgrim shell*. These shells were frequently adopted as heraldic devices by families whose ancestors had made the pilgrimage.

SHELL. See AMMUNITION.

SHELLAC. See LAC.

SHELLEY, PERCY BYSSHE (1792-1822). Poet. Shelley was born at Field Place, near Horsham, Sussex, of a family that had been recently raised to a baronetcy. In 1810 he entered Oxford, but his publication of a pamphlet on *The Necessity of Atheism* caused his expulsion from the university. For a time Shelley lived in London, supported by what his sisters could save from their allowances, but at length his father consented to provide for his son.



SHELLEY

Shelley's elopement with Harriet Westbrook, a pretty school friend of his sisters and daughter of a former tavern-keeper, once more turned his family against him. Some two years later he became estranged from his wife, and soon afterward visited the Continent with Mary Godwin. Two years later, his wife committed suicide by drowning, and Shelley suffered keenly from remorse. He married Mary Godwin, how-

ever, and with her and their children, went to Italy. In Italy, Shelley was associated with Byron and with Leigh Hunt, and there he produced some of his finest work. In June, 1822, he went with a friend for a sail on the Mediterranean, but the boat was overtaken by a storm, and both Shelley and his companion were drowned. His ashes were buried in the Protestant cemetery at Rome.

Shelley always longed to establish an ideal state of society, based upon the principle of universal brotherhood, and having as its object the development of individuality. He lived in continual rebellion against existing conditions, and sought to express himself in his verse. In *Queen Mab*, *The Revolt of Islam*, and

Prometheus Unbound, his theme is the complete liberation of the world. The poems which most completely set forth his ideals and aspirations seem to many readers enveloped in mystery. Most obscure of all are *The Witch of Atlas* and *Epipsychidion*.

His *Ode to the West Wind*, *The Cloud*, the *Ode to a Skylark*, *Lines to an Indian Air*, and the elegy *Adonais*, written on the death

of Keats, are typical of the best verse of the Romantic era.

SHELL-FISH. See CRUSTACEANS; MOLLUSCS.

SHELTON, THOMAS. Very little is known of the life of Thomas Shelton or Sheldon. He was the first translator of *Don Quixote* into English, and his translation, which was published in 1611, made Cervantes' story very popular in the writings of his contemporaries. Beaumont and Fletcher are obviously indebted to it in their *Knight of the Burning Pestle*. Shelton's translation has all the vigour and full-bloodedness which belongs to so much Elizabethan prose and, in spite of its inaccuracies, is still the best translation of Cervantes in English.

SHENSTONE, WILLIAM (1714-1763). Shenstone probably holds a more important position in the history of landscape gardening than in the history of literature. The grounds of his estate, which he beautified, were famous for their tasteful design.

His *Schoolmistress* (1742), a burlesque treatise, his *Pastoral Ballad* in four parts (1743), and his satirical poem the *Progress of Taste* ensure for him a place as a minor poet of merit.

SHEPHERD KINGS. See HYKSOS.

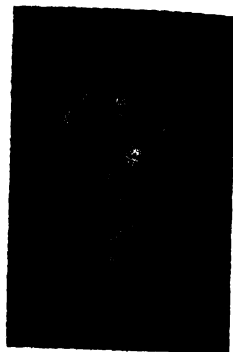
SHERATON FURNITURE. Named after Thomas Sheraton (1751-1806), one of the most famous English designers of furniture. In his fortieth year he published a book entitled *The Cabinet-Maker and Upholsterer's Drawing Book*. It could hardly be imagined that Sheraton should not have been influenced by such designers as Chippendale, Adam and Hepplewhite, but he nevertheless showed a high degree of originality. He was among the first to make use of satinwood and other fine-grained woods. Sheraton's originality was, however, no unmixed blessing, for though it led him to design furniture with a curved line which gave an impression of graceful elegance, it also led him to sacrifice beauty of line for richness of decoration, and his later work was often more sensational than beautiful.

SHERIDAN, RICHARD BRINSLEY BUTLER (1751-1816). An Irish dramatist whose fame rests chiefly on two comedies, *The Rivals* and *The School for Scandal*. Both are classics of English drama, ranking among the best comedies produced in England since the time of Shakespeare. Sheridan was born in Dublin. Though he studied law, his fondness for writing caused him to take up literature as a means of livelihood, and in 1775 *The Rivals* was successfully produced in London. In the same year, his comic opera *The Duenna* was staged. Soon afterward, he purchased Drury Lane Theatre, and managed it until 1809, when it was destroyed by fire.

Sheridan was very popular among the literary men of his time because of his wit

and charming personality, and he belonged to Dr. Johnson's famous Literary Club. He also won a name as an orator during a Parliamentary career of twelve years, especially for his speeches against Warren Hastings.

Besides the comedies mentioned, Sheridan's principal works are a farce called *Saint Patrick's Day* and a comedy entitled *The Critic*.



RICHARD SHERIDAN
Photo: Brown Bros

SHERIFF. The general term *sheriff* is derived from the Anglo-Saxon word for *shire reeve*, the shire being a political division in England corresponding to a modern county. The head man of the shire was called *reeve*.

After the Norman Conquest the status of the sheriffs was considerably raised, and they became royal officers with military, judicial, and fiscal powers. The judicial system of the shire under the sheriff was the central feature of Norman local government. The sheriffs were also left to farm the revenues, and this soon caused dissension, eventually the establishment of the Exchequer in the reign of Henry I curbed the fiscal powers of the sheriffs by demanding that they should present accounts. Then judicial functions were encroached upon by the justices in eyre appointed by Henry II, and by the end of the thirteenth century the rights and status of the sheriff had declined.

Nowadays, the appointment is considered an honour, as the office is unpaid and with few obligations. The sheriff is appointed each year for the county after the Chancellor of the Exchequer, with the help of the King's Judges, chooses three landowners from each county, the final choice being left to the King in Council. He attends on the judges in circuit, summons juries, and enforces all judgments of the High Court. Apart from the ceremonial duties, he delegates his work to the Under-Sheriff.

In certain cities which are by ancient privilege counties in themselves, the sheriff is appointed each year by the Council.

In the City of London, too, the sheriffs are appointed independently, a privilege derived from King John. The Court of Common Hall, consisting of the Lord

Mayor, aldermen, sheriffs, and all the "liverymen" of the City Companies, each year elect two sheriffs, and the office is an essential step to that of Lord Mayor. The name "sheriff" has spread to the New World, and in the U.S.A. and Canada we find the county officer taking this title; and some of the duties he performs are similar to those of the English sheriff.

SHERRY. A dry wine containing about 14 per cent of alcohol, named after the town of Jerez, in Spain, around which lie the choicest vineyards of the republic; here the best sherry is made. The finest grades are *amontillado* and *manzanilla*. Genuine sherry is light in colour, and has a delicate flavour. Some varieties are fortified by being mixed with brandy and other spirits, and are usually brownish.

SHETLAND ISLANDS. The most northerly group of the British Isles, lying about fifty miles north-east of the Orkney Islands, which lie off the north coast of Scotland



INTERIOR OF A SHETLAND ISLANDS COTTAGE
Photo Central

The Shetlands are a county of Scotland. They are a detached part of the highlands of Scotland and are built of the same hard, resistant rock of Pre-cambrian and early Palaeozoic age. Scenery is wild and picturesque around the coast. Surfaces are hilly but seldom over 1000 ft. in altitude. Harbours are abundant but little used. The climate is cool and rainy with frequent gales. Of the 100 islands only about 30 are inhabited, and several of these only by lighthouse keepers and a few shepherds. The total area is 352,319 acres, or about 556 sq. miles; the population is gradually decreasing, and in 1931 was 21,410. Mainland, the largest of the group, contains the chief town, Lerwick, which is a great fishing centre.

During the summer season, many tourists from the mainland visit the Shetlands.

The people are engaged chiefly in fishing and the rearing of cattle, sheep, and ponies, including the famous Shetland pony of diminutive size. Fine long wool is produced from a special breed of sheep and is used in domestic woollen industry. Fair Isle, half way between Shetlands and Orkneys, is famed for its knitted goods of many-coloured wool treated with vegetable dyes; and Unst for the finest quality woollens. The cultivation of oats, barley, and vegetables is also carried on in small holdings, but only about half the land is cultivated or used for grazing. The Shetlanders are largely of the Scandinavian racial type, and up to 1468 the islands were subject to the Scandinavian crown.

SHEWBREAD. The ceremonial table of the Shewbread (more correctly Bread of the Presence) was an important feature in the Jewish Tabernacle, and in Solomon's Temple and its successors. Upon it were placed twelve loaves, renewed every Sabbath, the number representing the twelve tribes of Israel, and the bread signifying man's dependence upon God for sustenance.

The last Table of the Shewbread, made by Judas Maccabaeus, was rescued from the burning Temple when Jerusalem was taken by the Romans in A.D. 70, and a representation of it, together with the golden candlestick, figures as a decoration on the famous Arch of Titus at Rome, which commemorated his triumph.

SHIBBOLETH, *shib' bo leth*. A Hebrew word, meaning "ear" or "hood," used by the Gileadites to entrap their fleeing enemies, the Ephraimites, at the fords of Jordan in the time of Jephthah (see Judges xii). Every man seeking to pass over from east to west was required by the Gileadites, who held the passages, to say "Shibboleth." The Ephraimites were unable to pronounce the Hebrew letter *sh*, and said "Sibboleth," and thus were detected and slain. The word has been adopted in modern use to denote, in a derogative sense, some party catch-phrase or slogan supposed to be a test of allegiance to its principles.

SHIELD. A word of unknown derivation, describing a piece of defensive armour borne on the left arm, or carried in the left hand, to ward off missiles and blows of a sword. The shield of an ancient Greek infantry soldier covered almost the entire body; that of the Romans was much lighter and smaller.

In the early Middle Ages, it was the most important part of the equipment of both horse and foot soldiers. If held at arm's length, it was called a *buckler*; if swung over the arm, with the arm across the body, it was termed a *target*.

It was customary to decorate the shield with many kinds of devices, the cross in various forms being much used. The device on the shield served to identify friend and foe at a time when men's faces were hidden by armour.

At the present time, uncivilized nations still carry shields to war. The shields of savage races are usually made of hardened oxhide.

SHITES, *she' ites*. Those who reject the first three caliphs as rightful successors of Mohammed. See MOHAMMEDANISM.

SHILLING. A silver coin in the English monetary system, equal to twelve pence. The shilling has a value of one-twentieth of a pound. Owing to the fluctuation in the value of money it is impossible to fix its value in relation to foreign coinages.

SHINGLES. See HERPES.

SHINGLES. Thin pieces of wood much used in Canada and sometimes also, in Britain to cover the roofs of buildings. They usually have a uniform length of 18 in., with average widths of 6 to 8 in. Shingles are nearly $\frac{1}{2}$ in. thick at one end, from which they taper uniformly to a thickness of less than $\frac{1}{2}$ in. at the opposite end. When laid on a roof, they must be made to overlap, one upon another, in such a manner that only 5 or 6 in. of any shingle shall be exposed to the weather.

SHINTOISM, *shin' to iz'm*. The ancient religious cult of Japan, the least developed of all the national religions, having no supreme deity and no moral code. Its central feature was sun-worship, and a system of ancestor-worship was also practiced. According to its traditions, the reigning emperor is descended from one of the Shinto gods. Shinto has not been able to maintain itself as a religion, but all court officials must observe its forms, as its rites have been adopted for the state religious ceremonies.

SHIP-MONEY. Originally an imposition upon seaport towns requiring them to provide and furnish certain ships for the Royal Navy. The earliest record of the imposition occurs in the reign of Ethelred, who levied ship-money in 1008 for the purpose of equipping a naval force to oppose the Danes. The levy was allowed to fall into disuse, but on the advice of his Attorney-General, Noy, it was revived in 1634 by Charles I, anxious to strengthen the fleet which had been sadly neglected by his father, James I. There was no dispute regarding the right of the king to require seaports to provide vessels in time of war, but it was doubtful whether the royal prerogative covered the right to demand contributions in money from the whole country in time of peace. The levy of 1634

was on seaport towns only, but that of 1635 was on the whole country, the judges deciding that the king had absolute discretion to decide whether a state of emergency had arisen. The levy of 1636 was resisted by Sir John Hampden, who refused to pay the twenty shillings demanded on the ground that it was a tax levied without consent of Parliament. His action had the effect of stiffening Parliament's resistance to the King.

In the Short Parliament (1640) Charles offered to renounce ship-money in return for an equivalent grant of subsidies, but the Commons rejected the offer. A year later the Long Parliament declared the levying of ship-money to be illegal and the judgment given against Hampden to be null and void.

SHIPPING, MERCHANT. At the beginning of the twentieth century, though the steamer was supreme, there still existed over 11,000 sailing ships of about 6,500,000 tons. By the outbreak of the World War this tonnage had been reduced by almost one-half, and in succeeding years it practically disappeared from the seas. In all statistics of merchant shipping, therefore, mechanically propelled vessels only have to be taken into account. The following figures show the growth of such shipping since 1900—

(1) At the beginning of this century (1900), 16,528 ships of 24,000,000 tons were afloat on the seas of the world.

(2) In 1914, when the World War broke out, the number of ships was 24,444 and the tonnage nearly 45,500,000 tons.

(3) In the years following the signing of the Peace Treaty, there was a great expansion in merchant shipping and by June, 1931, no fewer than 29,952 mechanically propelled vessels were afloat of 68,723,000 tons.

(4) By June, 1935, the number of ships had decreased to 29,071 and the tonnage to 63,727,000.

Effects of the War ; the Policy of Subsidies. The change in the shipping situation between 1914 and 1931 was due to the realization by most of the maritime nations of the world of the importance of the merchant ship as the auxiliary to the ship of war, for the carriage of troops and munitions and the supply of the needs of civilians, since the World War proved that no country, however rich in natural resources, could exist in comfort without the supplies which only ships could convey. While the World War was in progress, the United States Government developed many shipyards and trained thousands of craftsmen in order to make good the losses of tonnage which the Allies were suffering from the action of



TRAMP STEAMERS UNLOADING RAW MATERIALS FOR MANUFACTURE OF CHEMICALS
Photo Middlesbrough Corporation



THE WEAR AT SUNDERLAND
Photo Middlesbrough Corporation

submarines and mines. No considerable part of this war programme was completed before the end of the struggle, but the ambition of the Americans to possess a great merchant fleet had been aroused, so that they would have plenty of tonnage at their disposal complementary to their war navy in the event of their being at war, and for the conduct of their foreign trade if they were neutral in a war between other nations. The American Government, in pursuit of these aims, provided loans for the building of more ships and subsidies to enable them to be operated. It is estimated that by 1931 Congress had spent about £600,000,000 on American shipping, and it continued to pursue this policy in spite of the contraction

It was owing to State aid, provided without regard to the decrease in the number of passengers to be carried and the volume of goods to be transported, that the tonnage of the world rose by 23,000,000 tons between the date of the signing of the Peace Treaty and 30th June, 1931. Economic troubles then restrained the activity in the shipyards, with the result that in the succeeding four years the tonnage shrank by about 5,000,000 tons.

As a consequence of the awakening of the nations of the world to the importance of shipping under peace as well as war conditions, the balance of mercantile sea-power changed in a remarkable way, as the following figures show--

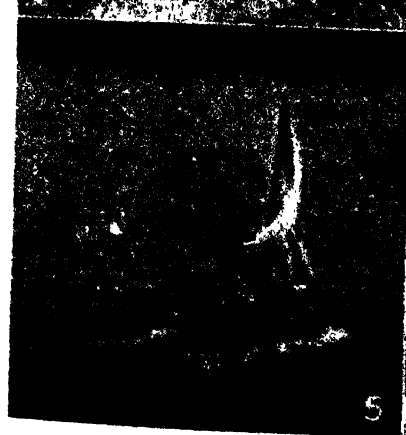
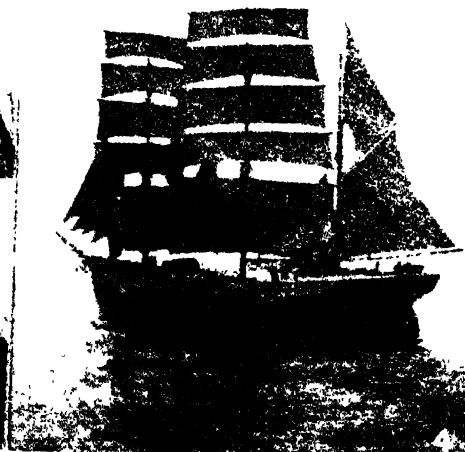
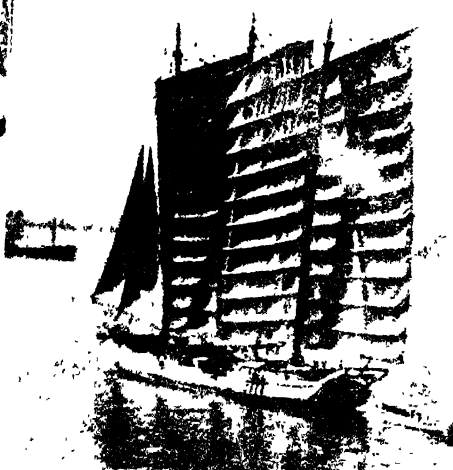
Countries	Difference Between--			
	1925 and 1914	1935 and 1925	1935 and 1914	Per Cent
	Gross Tons	Gross Tons	Gross Tons	
Gt. Britain and Ireland	+ 413,000	- 2,007,000	- 1,594,000	- 64
British Dominions	+ 917,000	+ 353,000	+ 1,354,000	+ 53
Denmark	+ 252,000	+ 77,000	+ 329,000	+ 42
France	+ 1,398,000	- 331,000	+ 1,067,000	+ 55
Germany	- 2,129,000	+ 687,000	- 1,442,000	- 28
Greece	+ 74,000	+ 816,000	+ 890,000	+ 100
Holland	+ 1,116,000	- 34,000	+ 1,082,000	+ 73
Italy	+ 1,501,000	- 93,000	+ 1,408,000	+ 98
Japan	+ 2,212,000	+ 166,000	+ 2,378,000	+ 139
Norway	+ 661,000	+ 1,349,000	+ 2,010,000	+ 102
Spain	+ 259,000	+ 21,000	+ 280,000	+ 31
Sweden	+ 239,000	+ 287,000	+ 526,000	+ 51
United States (Sea)	+ 9,905,000	+ 2,267,000	+ 7,638,000	+ 37
" (Lakers)	+ 17,000	+ 203,000	+ 220,000	+ 2
Other Countries	+ 87,000	+ 2,699,000	+ 2,177,000	+ 62
Totals	+ 16,976,000	+ 1,347,000	+ 18,121,000	+ 10

of international trade. Other Governments followed the American example until there was hardly a nation which was not, by means of taxation, subsidizing its shipowners and, in some cases, its shipbuilders. This movement was stimulated by the action of the Allies in compelling Germany to surrender practically all her ocean-going tonnage as a reprisal for the manner in which her submarines had been used, it being generally assumed that Germany, which had ranked as the second sea-carrying country in the world, would be unable for many years to regain her position at sea, with the result that passengers and cargoes would be available for the ships of other nations. Other contributory factors were the loss of 7,000,000 tons by British shipowners and the dislocation of their services during the years when shipping was controlled and concentrated on war services.

The preceding table shows that from June, 1914, to June, 1925, the net increase in the world's steam and motor tonnage was 16,976,000 tons, equal to 37.4 per cent of such tonnage in existence in 1914, and that the net addition since 1925 amounted to 1,347,000 tons, equal to 2.2 per cent of the tonnage at 1925.

A comparison of the figures for 1914 and 1925 shows that the largest increases took place in the United States (9,905,000 tons), Japan (2,212,000 tons), Italy (1,501,000 tons), France (1,398,000 tons), and Holland (1,116,000 tons). The only decrease during this period was that in the case of Germany (2,129,000 tons).

Since 1925, the largest increases took place in Norway (1,349,000 tons), Greece (816,000 tons), Germany (687,000 tons), British Dominions (353,000 tons), and Sweden (287,000 tons); on the other hand,



SHIPPING CONTRASTS

Rigging of a windjammer in the London docks after taking part in the grain race from Australia
 Manning the windlass on a windjammer. 3 Japanese sailing craft 4 Finnish barque *Prompt*
 Native craft, Philippine Islands. 6. R.M.S. *Queen Mary* passing the *Majestic* on her way to
 Southampton Graving Dock.

Photos: M. Dougall, Norddeutscher Lloyd, Bath Line, George Le

the sea-going tonnage of the United States decreased by 2,267,000 tons, and that of Great Britain and Ireland by 2,007,000 tons. There were also decreases in France (331,000 tons), Italy (93,000 tons), and Holland (34,000 tons).

On the other hand, since June, 1914, there has actually been a *net* decrease in the tonnage belonging to Great Britain and Ireland of 1,594,000 tons, or 8·4 per cent of the tonnage owned in 1914, whereas the aggregate increase of tonnage owned in other countries during the same period represented more than 75 per cent of the pre-war tonnage owned abroad.

The present century has witnessed unprecedented development in the mercantile fleets of the world, the tonnage having increased from 24,008,883 tons in 1901 to 63,727,317 tons in 1935. The increase in the tonnage owned abroad is indicated in the following table, comprising the eight leading countries—

specially designed for different purposes and propelled by various means. There are passenger liners, cargo liners, ships for carrying oil in bulk, ships built for the carriage of meat, fruit and dairy produce, either frozen or chilled, and other ships known as tramps which go anywhere and do anything, being mainly engaged in the transport of bulk cargoes, such as grain, coal, ores and other heavy articles. The passenger ship also carries cargo in "parcels" and the cargo liner usually has accommodation for a limited number of passengers, while the tankers differ from one another, some carry, as a rule, only petroleum, others lubricating oils and others, again, oils of all kinds.

Oil as the Modern Fuel. While passenger and cargo ships as well as tramps have increased in size and speed, construction of the oil tanker, owing to the increased use of liquid fuel on shore as well as at sea, is one of the most noteworthy developments. Everywhere coal was used in the past for the production of power, but now most of the navies of the world depend on oil fuel, and in the merchant fleets oil fuel has more and more displaced coal, as the following statement reveals—

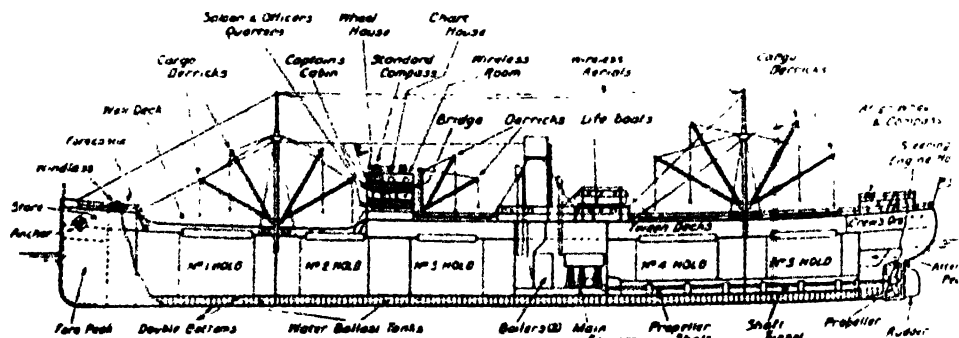
Country	Percentage of Steam and Motor Tonnage Owned in the World		
	1901	1914	1935
Gt. Britain and Ireland	50.2	41.6	27.1
United States (sea)	4.2	4.5	15.2
Japan	2.2	3.8	6.4
Norway	3.4	4.3	6.4
Germany	10.1	11.3	5.5
France	4.4	4.2	1.7
Italy	2.7	3.1	4.5
Holland	2.1	3.2	4.0

It will be seen that, apart from Great Britain and Ireland, France is the only country showing a decrease in the proportion of tonnage owned during the period 1901-1914.

There is a tendency to regard ships as varying in size, but generally of one class. There are, however, a variety of types.

	1914	1935
	% of Total Gross Tonnage	% of Total Gross Tonnage
Coal	88.84	59.15
Oil fuel for boilers	2.65	50.68
Oil, etc., in internal combustion engines	0.45	17.42
Sailing vessels, non- propelled barges, etc.	8.06	1.76
	100.00	100.00

Slightly over 50 per cent of the tonnage of the world's merchant marine now depends



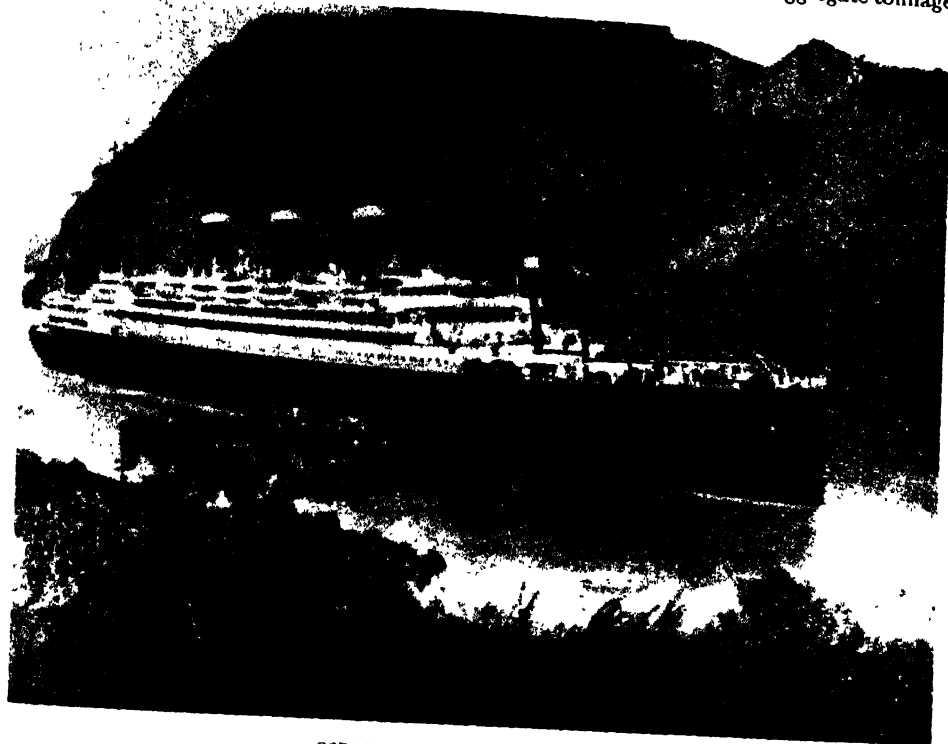
PARTS OF A SHIP

entirely upon coal, while in 1914 the percentage was nearly 89. The tonnage of steamers using coal, which in 1914 reached 43,860,000 tons, is now 32,538,000 tons, or, say, upwards of 11,000,000 tons less.

Whereas at the opening of the twentieth century, practically all mechanically-propelled ships had reciprocating steam engines, now the competition between various types

turbines, but there was a reduction of 1,366,000 tons in steamers fitted solely with reciprocating steam engines. Moreover, of 8,896,437 tons of oil tankers of 1000 tons gross and upwards, 5,161,342 tons are steamers and 3,735,095 tons are fitted with internal combustion engines.

While the total motor tonnage amounts to only 17.4 per cent of the aggregate tonnage



OCEAN LINER IN THE PANAMA CANAL
Photo Wide World

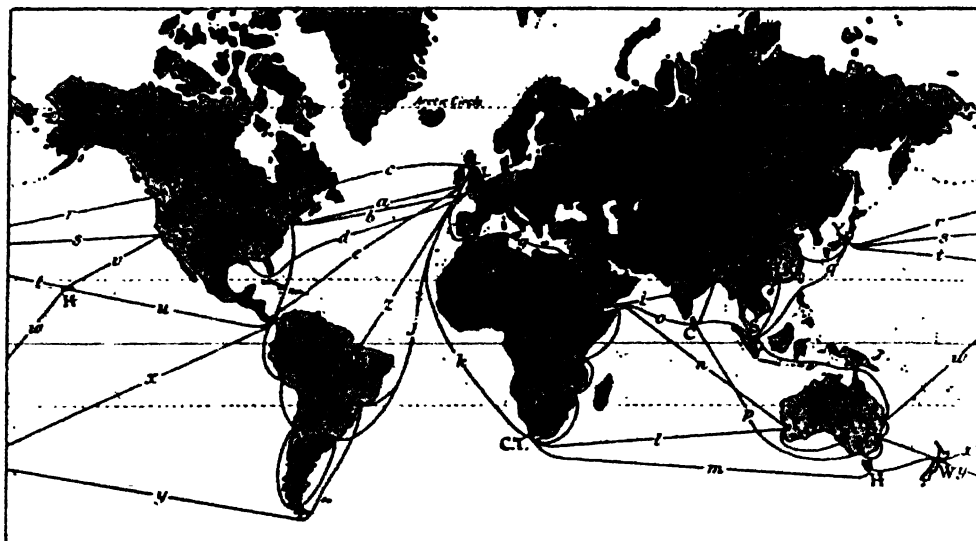
of prime movers is so keen that shipowners find it no easy matter to decide how they shall equip new ships which they desire to build. The most remarkable engineering development has been due to the turbine and the internal combustion engine.

There are 1522 steamers of 10,428,473 tons fitted with turbine engines or a combination of steam turbines and reciprocating engines, and 5511 vessels (including auxiliary vessels) of 11,304,691 tons, fitted with internal combustion engines, as compared with 730,000 tons and 220,000 tons respectively in 1914.

Between June, 1934, and June, 1935, there was an increase of 700,000 tons in the tonnage of motor-ships, and of 36,000 tons in the tonnage of vessels fitted with steam

owned in the world (in Great Britain and Ireland 16.6 per cent), the highest percentages are to be found in the following countries, viz.: Norway 48.6, Denmark 41.8, Sweden 36.5, and Holland 33.0. Among the principal maritime countries, the United States and France have the smallest proportions of motor tonnage, viz. 5.8 and 8.1 per cent respectively.

Three hundred vessels, with a total tonnage of 1,866,506 tons, are fitted with a combination of steam turbines and reciprocating engines, and in 90 vessels, with a tonnage of 601,497 tons, electric propulsion has been adopted, the motors being supplied with current from generators which are driven either by steam turbines or by oil engines. Auxiliary electric drive has also



PRINCIPAL SHIPPING ROUTES

(a) Liverpool to New York (3043 miles); (b) Hamburg to New York (3395 miles); (c) Liverpool to Montreal (2760 miles); (d) Southampton to New Orleans (4603 miles); (e) Liverpool to Panama (4570 miles); (f) London to Gibraltar (1316 miles); (g) Gibraltar to Port Said (1006 miles); (h) Port Said to Aden (1399 miles); (i) Aden to Bombay (1660 miles); (j) London to Buenos Aires (6298 miles); (k) London to Rio de Janeiro (5223 miles); (l) London to Cape Town (6400 miles); (m) Cape Town to Fremantle (4710 miles); (n) Cape Town to Hobart (5742 miles); (o) Aden to Fremantle (4920 miles); (p) Aden to Colombo (2100 miles); (q) Colombo to Melbourne (4681 miles); (r) Singapore to Yokohama (2020 miles); (s) Yokohama to Vancouver (4320 miles); (t) Yokohama to San Francisco (4758 miles); (u) Yokohama to Honolulu (3390 miles); (v) Honolulu to Panama (4685 miles); (w) Honolulu to San Francisco (2100 miles); (x) Brisbane to Honolulu (4130 miles); (y) Wellington to Panama (6488 miles); (z) Liverpool to Belem (Para) (4043 miles).

been adopted in a number of other vessels. Of the 99 vessels mentioned above, 60 of 286,761 tons are owned in the United States. Of electrically-driven vessels exceeding 20,000 tons gross, five fly the British flag, two are owned in the United States, and one is owned in France. As to the number of screws, of the 29,071 steamers and motorships of 100 tons gross and upwards, 3668 are twin-screw vessels, and 115 have triple or quadruple screws.

Ocean-going Tonnage. Not all the ships are engaged in the ocean trades between nation and nation. The tonnage of the 1445 oil tankers, of 1000 tons gross and upwards, amounts to 8,896,437 tons, 379 of 2,313,341 tons are registered in Great Britain and Ireland, 388 of 2,491,368 tons are registered in the United States, and 221 of 1,564,557 tons in Norway. In addition, there are 112,535 tons of tankers of less than 1000 tons each. The tonnage of steam and motor

Countries	Total Tonnage		Ocean-going Tonnage	
	Tonnage Owned	Percentage of World Total	Tonnage Owned	Percentage of World Total
Gt. Britain and Ireland	17,298,432	27.14	10,898,526	36.12
United States of America	12,223,254	19.18	5,339,272	17.60
Germany	3,693,298	5.80	2,259,427	7.49
Japan	4,085,650	6.41	2,132,668	7.07
France	2,989,386	4.69	1,710,298	5.67
Italy	2,838,354	4.45	1,682,030	5.57
Holland	2,553,776	4.01	1,478,791	4.90
Norway	3,966,719	6.22	1,005,438	3.33
Other Countries	14,078,448	22.10	3,688,231	12.16
World Totals	63,727,317	100.00	30,194,691	100.00

trawlers and other fishing vessels and whalers amounts to 1,104,960 tons. An analysis of the vessels recorded in *Lloyd's Register Book* shows that 393,622 tons represent tugs and salvage vessels; ferries amount to 230,482 tons; cable vessels to 74,543 tons; while river vessels and vessels owned by Municipal Corporations or Harbour Authorities, and steam barges, dredgers and similar craft, amount to 498,502 tons. It will thus be seen that, without taking into account size, age or material, there are about 11,311,000 tons of vessels which are not used for ordinary cargo and passenger purposes.

If such vessels of these types be deducted from the total tonnage as well as vessels trading on the Great Lakes of North America, wooden and composite vessels, vessels of less than 4000 tons gross, and vessels over 25 years old, and presumably of less efficiency than more modern vessels, the figures on page 3934 are obtained which indicate the relative position of the principal maritime countries as regards the more efficient ocean-going vessels available for general cargo and passenger purposes.

It will be seen that the merchant fleet of Great Britain and Ireland, while including 27.14 per cent of the world's tonnage, actually comprises 36.12 per cent of the more efficient ocean-going tonnage available for general cargo and passenger purposes.

Considerable differences are also shown as regards five other countries, viz.: Germany, Italy, France and Holland—which from percentages of 5.80, 4.45, 4.69 and 4.01 respectively of the total tonnage, rise to 7.49, 5.57, 5.67 and 4.90 per cent of the ocean-going tonnage as defined above—and, on the other hand, there is Norway, which, from 6.22 per cent, is reduced to 3.33 per cent. This reduction is, of course, due to the very large proportion of oil tanker tonnage included in the Norwegian merchant marine.

As has been stated, a great increase in the size as well as the speed of ships of all types has taken place in the past quarter of a century, owing to commercial rivalry, and this rivalry has been encouraged by many governments. They have subsidized ship construction on the ground that it was a matter of national prestige that a country should produce fast and luxurious liners. The Blue Ribband of the Atlantic, which was held by the Cunard liner *Mauretania* (30,666 tons and 28 knots speed) for over 20 years, was then won by two ships built in Germany, the *Bremen* and *Europa*; later the laurels were gained by the Italians with the *Conte di Savoia* and *Rex*; these ships were subsequently outrivalled by the *Normandie*; and it was not until the summer

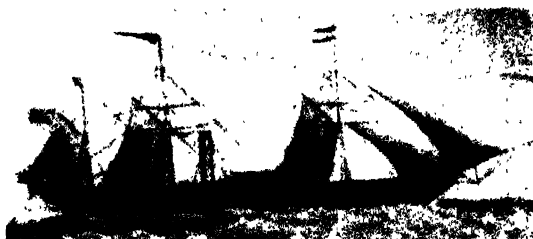
of 1936 that the British liner, *Queen Mary*, regained the Blue Ribband.

Some of the swiftest, though not very large, ships are engaged in the British-Continental services. The *Brighton*, *Cambria*, *Hibernia*, *Scotia*, *Worthing* and *Paris* are turbine-driven vessels capable of reaching a speed of 25 knots, and there are a number of others, with the Belgian motor-ship *Prince Baudouin* (24 knots) and British turbine ship *Maid of Orleans* (23½ knots) leading, which can steam at upwards of 22 knots. In tonnage the newest and swiftest of these Cross-Channel ships range from 2000 to 3000 tons only.

It was estimated at the beginning of 1936 that, owing to the increase in the volume of the world's tonnage, the improvement in ship design, and the increase of speed, enabling voyages to be made in a shorter time than in the past, the supply of tonnage was about 45 per cent in excess of the demand.

SHIPS AND SHIPBUILDING. The great revolution in shipbuilding occurred less than a century ago, when the iron ship—iron giving place in its turn to steel—replaced the wooden ship. From the dawn of history, men had made voyages in various types of vessels, and though variations in design were made and the size gradually increased, progress was retarded owing to the limitations imposed on the craftsman by the tendency of wooden vessels of great tonnage to "hog"—the material, in short, was suitable only for ships of moderate length and breadth. Under these conditions, since so many countries possessed suitable woods, shipbuilding was carried on in all parts of the world, some famous ships being built in India. In French yards from time to time finer frigates and even three-deckers were built than in the British Isles, and many British men-of-war were replicas of prizes captured from the French under war conditions, while the Americans were famous for their swift clippers.

Britain's Lead. When the practicability of constructing ships of iron was admitted, after a long controversy, British shipbuilders, with ample supplies of coal and ore at their disposal, took the lead of the world in shipbuilding. The new technique was acquired in British yards quicker than elsewhere, with the result that when the economic advantages of ships of what may be described as the steel age were revealed, the industry in the British Isles forged ahead, shipowners from every quarter of the globe placing orders for new vessels. It has been said that "there are few important industries where the predominance of British manufacture has been more marked than in shipbuilding and



EVOLUTION OF THE STEAMSHIP 1840 TO 1874

1. Cunard P.S. *Britannia* (1840). 2. Cunard P.S. *Scotia* (1862). 3. Cunard R.M.S. *Russia* (1867). 4. White Star S.S. *Oceanic* (1870). 5. White Star S.S. *Britannic* (1874).

Photos: Cunard White Star Ltd.

marine engineering" (Booth Committee on Shipbuilding, 1918). Practically all the most notable merchant ships, irrespective of the flag carried, were launched from British yards and a large proportion of foreign men-of-war, especially those of Japan, Russia, China, Portugal, Spain and the South American Republics, were also built to the designs of British naval architects and launched in British waters.

The highest output of British shipyards of mercantile tonnage was reached in the later years of Queen Victoria's reign; in the years 1892-94, 81.6 per cent of the merchant ships sent afloat were constructed to British designs in British yards by craftsmen who were unrivalled in skill. This supremacy was challenged in subsequent years when the British percentage was gradually reduced—

Years	Percentage Br.
1892-94	81.6
1895-99	72.8
1900-04	59.9
1905-09	61.0
1910-14	61.9

During the last years of the World War all development in research and design was necessarily arrested. Such vessels as were built in haste in the British Isles and the United States during the height of the submarine campaign were of what came to be known as "standard design," the main objective being rapidity of output. The emergency was so great in 1917 that on both sides of the Atlantic old-established shipyards and engine shops were extended and new ones laid out, and as soon as the War was over a great shipbuilding movement in all parts of the world developed. During the struggle it had been proved, first, that every war navy needed mercantile tonnage for auxiliary purposes, and, secondly, that no country could exist in reasonable comfort without overseas supplies of food or raw materials. In the United States, France and other countries, subsidies were provided to encourage ship construction, with results which are reflected in the table, shown on page 3940, of the launchings in the principal maritime countries.

Post-War Development. Shipyards were laid out and men trained in countries which before the World War were negligible from the shipbuilding standpoint. This spread of activity occurred at a time when in hull design, engineering and general equipment greater progress was being made than at any previous period in the history of ship construction. The ships that were launched reflected the widespread research carried out with wax models in experimental tanks, in the British Isles, the United States, Germany, Japan and other countries.

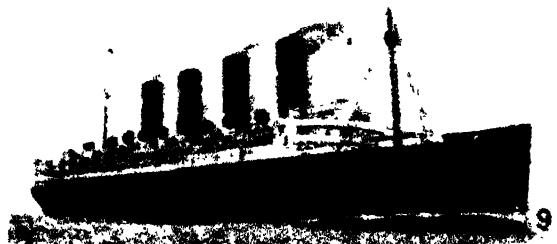
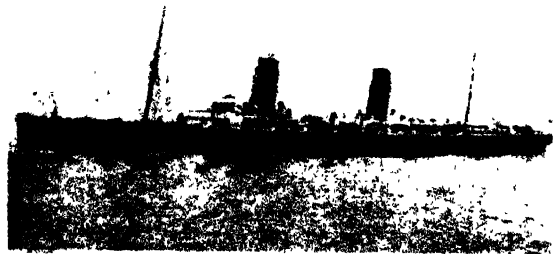
The modern ship is no longer an empirical product, but the result of the application of scientific principles to speed and safe and economic navigation for the purposes of business or pleasure, with the result that a shipowner has only to specify what type of ship he requires and the naval architect can supply him with exactly what he wants in all respects—tonnage, speed, and passenger and/or cargo accommodation, and also give an exact estimate of its initial cost and the expense of operation. The only limit to size is depth of water for navigation and capacity of available docks, and hence it is on the North Atlantic, with its great American and British ports as terminals, that the biggest ships are to be found, the limit in 1936 being the *Queen Mary* and *Normandie*, each of upwards of 80,000 tons gross and a length of about 1000 ft.

The *Queen Mary* and *Normandie* compare as follows—

Queen Mary Normandie

Gross tonnage =	80,773	82,799
Net tonnage =	34,118	36,471
Length b.p =	975.2 ft.	981.4 ft.
Breadth =	118.6 ft.	117.9 ft.
Depth =	68.5 ft.	57.6 ft.

Shipbuilding has been thus converted from a rule of thumb into a highly technical industry, calling for the construction of ships of many types and the making of a great variety of prime movers. In spite of the new complexities of the industry, its progress has not been arrested in any of the countries in which it was established in the years succeeding the close of the World War. The main difference



EVOLUTION OF THE STEAMSHIP 1879 TO 1911

6. Cunard R.M.S. *Gallia* (1879). 7. Cunard R.M.S. *Etruria* (1884). 8. White Star R.M.S. *Titanic* (1911).

GROSS MERCHANT TONNAGE LAUNCHED IN THE PRINCIPAL MARITIME
COUNTRIES AND IN THE WORLD—1918-35
(000's omitted)

	Gt. Brit. & N. Ireland	Denmark	France	Germany	Holland	Italy	Japan	Sweden	United States ¹	Total ² of the world
1918	1348	26	13	—	74	60	489	39	2602	5477
1919	1620	37	32	—	137	82	611	50	3579	7144
1920	2055	60	93	—	183	133	456	63	2348	5861
1921	1538	77	210	509	232	170	227	65	1004	4356
1922	1031	41	184	525	163	101	83	30	97	2467
1923	645	49	96	345	65	66	72	20	96	1643
1924	1439	63	79	175	63	82	72	31	90	2247
1925	1084	73	75	406	78	142	55	53	78	2193
1926	639	72	121	180	93	220	52	53	115	1674
1927	1225	72	44	289	119	101	42	67	124	2285
1928	1445	138	81	376	166	58	103	106	86	2699
1929	1522	111	81	249	186	71	164	107	100	2793
1930	1478	137	100	245	153	87	151	131	214	2889
1931	502	125	103	103	120	165	83	112	202	1617
1932	187	22	89	80	26	47	54	43	143	726
1933	133	34	34	42	35	16	74	60	10	489
1934	459	61	15	73	46	26	152	49	24	967
1935	499	122	42	226	57	22	145	105	32	1302

lies not in the character of the design or workmanship, but in the speed of construction and cost. Owing to climatic and other favourable conditions a ship can still be built more rapidly in British than in most foreign yards, Russian establishments in this respect being under a heavy handicap, while costs vary greatly, being very low, for instance, in the British Isles where the industry is conducted with great economic efficiency, and high in the United States where the expenditure on a ship of similar size and specification is about twice as high as in British yards.

Rigging. Although with the coming of steam, masts and rigging in the majority of ships were reduced to the bare minimum necessary for supporting the cargo derricks and spreading the wireless aerials, that branch of the seaman's art which deals with the rigging and handling of masted ships is by no means dead. A goodly number of sailing vessels continue to ply in the coasting trade, and some of their larger sisters still take their part in the carrying of grain and other merchandise where carrying capacity in bulk is required and speed is not a desideratum.

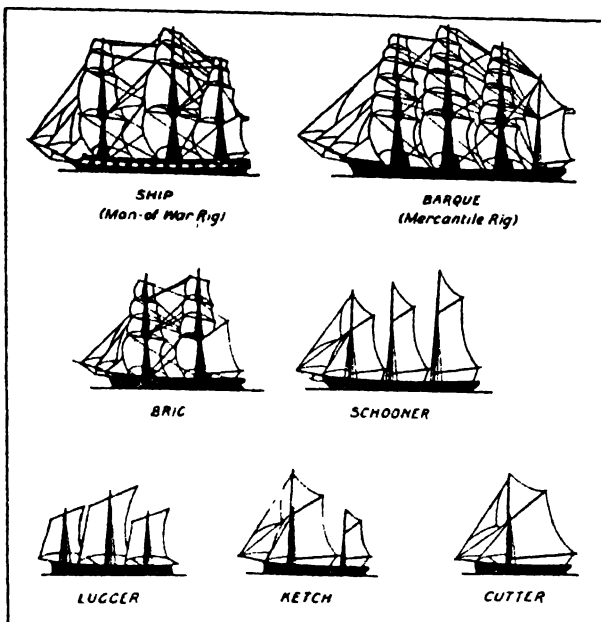
Sailing vessels are classified according to their rig. First in order come the *ships*, which are vessels having three, four or five masts and *square-rigged* (i.e. having their sails spread on *yards* slung athwart the masts). Next are the *barques* which have the same number of masts as the ships, but spread fore-and-aft canvas only on their after mast. Some of the noblest sailing vessels afloat to-day are barque-rigged.

Barquentines also have three or more masts, but are square-rigged on the foremast only. *Brigs* have two masts and are square-rigged on both; *brigantines* are square-rigged on the foremast only. *Schooners* have two, three, four, or even five masts but spread only fore-and-aft canvas, except that in *topsail schooners* a small topsail may be carried on the foremast. *Luggers* have two or three masts with a *lug* sail on each. The rigs of *ketches* and *yawls* are very similar, each has a mainmast with a shorter mizen mast abaft it, but in the yawl the mizen mast is very much smaller than in the ketch and is stepped aft of the rudder head. Cutters have only a single mast. These last three types have fore-and-aft canvas only.

Rudder. The appliance by means of which a ship is steered. In early vessels the steering was effected by means of a *steering oar* (old English *steer-board*) which was customarily placed on the right-hand side of the stern-post. This gave rise to the term *starboard*, still used to denote the right-hand side of the ship (the opposite side being known as *larboard*). The steering oar in due time gave place to the rudder, which consisted essentially of a board hinged at its forward edge to the stern-post and reaching down into the water. By means of a *tiller* the rudder could be moved from side to side, when the thrust of the water against the inclined surface so presented caused the vessel to turn. As ships grew in size the tiller became unwieldy, and the *steering-wheel* was devised. It was usually situated on or under the poop, and consisted of a large spoked wheel carrying

Excluding ships for operation on the Great Lakes.

on its shaft a drum. *Tiller ropes*, at first of rawhide but later of chain, were wound round this drum and their ends carried down through suitable leads and secured to the tiller. As the wheel was turned, it caused one rope to wind on to, and the other to wind off the drum, thus moving the tiller in the desired direction. With the great increase of size in ships which followed the introduction of steam, it was found that the hand wheel lacked sufficient power, and steam steering engines were brought into use. The wheel was retained, but it was now used merely to operate the valve which controlled the steering engine. By an ingenious arrangement, the steering engine was made to follow exactly the movements of the wheel, so that the movements of the rudder could be adjusted to a nicety. In ships of the most modern construction the steam steering engine is giving place to electric. Further, an attachment has been perfected for the gyroscopic compass, with which an increasing number of ships are being equipped, by means of which the rudder is controlled directly by the compass, the helmsman being eliminated. It is found that with the aid of this device a more accurate course can be steered, which on a long run results in an appreciable saving in fuel. A helmsman is, however, kept



RIGS OF SAILING SHIPS

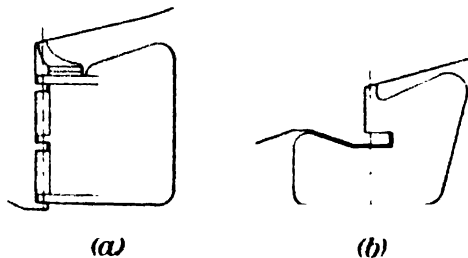
has led to the introduction of the *balanced* rudder, in which a portion of the surface of the rudder is carried forward of the axis ((b) in the diagram). The areas before and abaft the rudder axis are so arranged that the leverages they exert counteract each other, and thus the effort required to move the rudder is reduced to a minimum.

SHIRE. See COUNTY; LOCAL GOVERNMENT, SHERIFF

SHOCK. A profound depression of the vital mechanism of the body following injury, haemorrhage, or the absorption of certain toxins. The exact processes at work in the production of shock are by no means clear, but the essential factor appears to be exhaustion of the *vaso-motor* centre of the brain, i.e. the portion of the brain which, in health, controls the pressure of the blood and the vigour of the circulation through the contraction or relaxation of the muscular walls of the blood-vessels.

In a case of shock, the blood pressure falls very low, the face is pale, the skin cold and clammy, the pulse is rapid and very feeble, the breathing rapid, irregular, and sighing; the temperature is subnormal. The patient is either unconscious or at least very drowsy.

The treatment of shock, after the haemorrhage or other cause has been dealt with, is first to administer a nervous sedative, the best being a hypodermic injection of morphia. Then warmth must be promoted, and fluid must be restored to the circulation



TYPES OF RUDDER

standing by, as his services are still necessary in case of breakdown or if any intricate manoeuvring has to be carried out.

The ordinary rudder ((a) in the diagram) has one drawback in that the point at which the effective pressure upon it acts is some distance abaft the axis about which the rudder turns. It thus exerts a considerable leverage. In ships of moderate speed this is of little consequence, but in fast ships such as men-of-war or liners it would necessitate an unduly powerful steering engine. This

by the introduction of saline solution either directly into a vein, or under the skin; stimulants such as brandy may be introduced with the saline. As soon as the patient can manage it, easily digested food in small quantities is given.

SHOEBILL. A huge, blotched yellow bill, broad and depressed, has given the name to this singular bird, found only in the valley of the White Nile, and which is variously described as a heron or a stork. It is now generally known as the shoe-billed stork.

Long-legged, gray, and lank, the shoebill wades through the shallow water, feeding on



SHOEBILL.

Photo. U. & C.

fish and snakes. When startled, it takes refuge in trees.

Like herons, shoebills fly with the neck curved in a letter S, while the long, black legs trail out behind; they live in large flocks, and sometimes prey on small animals. From two to twelve chalky-white eggs are laid in a hole in dry ground, carelessly lined with leaves and grass.

In Arabian idiom, the bird is called "father of a shoe."

Scientific Name. The scientific name of the bird is *Balaeniceps rex*.

SHOES. See **BOOTS AND SHOES**.

SHOGUN, sho' goon. A Japanese term for

great general, or commander-in-chief. For several centuries previous to 1867, the shogun class, or shogunate, had exercised the real power in Japan, though nominally subject to the emperor. In 1192 the Emperor Takahira made Yoritomo, the Minamoto leader, a *Sei-i-tai-shogun*, meaning "barbarian-subduing, great general." Successive generals held the title until it became hereditary in the Tokugawa family.

The revolution of 1867 restored the power of the emperor, and the title of shogun was abolished.

SHOOTING STARS. See **METEORS**.

SHORTHAND. Enthusiastic shorthand writers are sometimes tempted to claim greater antiquity for their art than is warranted by established facts, and the origin of shorthand writing has been credited to the ancient Egyptians, the Greeks and the Romans.

There is no doubt, whatever, that shorthand, or abbreviated writing, was practised 2000 years ago in ancient Rome in the days of the Caesars, when Tiro, the freed man and secretary of Cicero, invented or evolved a system of brief writing, based upon a number of arbitrary signs and abbreviations of the Roman alphabet. It is on record that Tiro reported the speech of Cato on the Catiline conspiracy, his "note-book" consisting of a wax-covered board, while his pen was a metal "stylus." From contemporary records we gather that in order to secure a verbatim note, a corps of shorthand writers had an arrangement whereby each secured half a dozen words or so, and afterwards pieced their notes together and so secured a "full report." This system known as "Tironian Notes," was considerably enlarged by Seneca, who is said to have added some 5000 characters, from which it will be gathered that the scribes of those early days had to be men of application and industry.

The pioneer of modern shorthand was Dr. Timothy Bright, who, in the year 1588, published a system which he described as *Characterie, the art of short, swift, and secret writing, by character*. It was printed in London, "with the privilege of the Queen, forbidding all others to print the same." Each word was represented by a single character, and words were formed by the addition of dashes, loops, hooks and other devices.

The book is now very rare, only a few copies being in existence.

Several hundreds of systems have since been published, but the great majority failed to make a strong public appeal and in due course passed into oblivion.

In 1602 John Willis published *The Art of*

Stenography. The material employed consisted of straight lines and curves, a circle and a dot, but to these simple signs he added so many contrivances that the system was somewhat cumbersome and unwieldy.

The Art of Stenography was followed in 1618 by *An Abbreviation of Writing by Character* by Edmund Willis. This system had much in common with that of John Willis.

The next compiler of a shorthand system was Thomas Shelton, whose work was issued some time between 1620 and 1630. Shelton published a number of editions, under various titles, including *Short Writing*, *The most exact methode*; *Tachygraphy*, *A Tutor of Brachygraphy* and *Zylographia*.

About the year 1635 the system of Theophilus Metcalfe appeared, and is reputed to have passed through over fifty editions. It is interesting to note that the sixth edition (1645) bore the title *Radio Stenography*.

Jeremiah Rich, in 1646, issued *Charactery*, for which he claimed that "the full understanding of this art is easily attained in one week's time by the help of this book only." The fact that the practice of shorthand was becoming more widespread is proved by the fact that the Book of Psalms and the New Testament were engraved in Rich's system.

In 1672 William Mason issued a system, based on that of Rich, and grandiloquently entitled *A Pen Plucked from an Eagle's Wing. or, the most swift, compendious, and speedy method of short writing*. During his lifetime three editions of his work were issued, and these had a considerable sale.

The next volume of note was that of James Weston, who, in 1727, published *Stenography Completed, or the art of Shorthand brought to perfection*. His system was based on that of Metcalfe. The book consisted of 200 pages, and was possibly the largest book on shorthand that had appeared.

In 1760 John Mitchell was responsible for a system, which was based on that of Weston. It was entitled *Stenography Completed and made Universal, or an Exposition of the whole Art of Shorthand*. It was a lengthy and rather complicated system. Later he issued his system under the title *Shorthand made Easy*.

In 1784 John West founded a system which was based on Mason's second edition, but the most important adaptation of the system was that issued by Thomas Gurney in 1750, under the title of *Brachygraphy*. Gurney secured an appointment as shorthand writer to the Government, a post which was held by members of the family for a great many years. Charles Dickens became an expert writer of this system, and in *David Copperfield* gives an interesting and amusing

account of his efforts to master its many intricacies.

Also in the year 1750 Tiffin's system was issued. This system was built up on the phonetic principle.

Many other methods followed, and in 1767 a system invented by John Byrom was published, some years after the death of the author. It was entitled *The Universal English Shorthand*.

His system was improved, or at any rate modified, by John Palmer in 1774, by Thomas Molineux in 1804, and others.

Samuel Taylor, who also owed something to Byrom, issued, in 1786, *An Essay intended to establish a standard for a Universal System of Stenography, or Shorthand Writing*. Taylor's system was comparatively simple, and did much towards establishing the art of shorthand writing in England. That it was a good system is proved by the fact that it had many imitators.

Passing over a number of systems which failed to make any great impression on the world, we come to that of Isaac Pitman, who, in 1837, issued *Stenographic Sound-hand*, a small book of 12 pages and two plates, price 4d. This was the forerunner of the system which is so widely used throughout the world to-day. It has been adapted to over thirty languages.

Up to 1868 twelve editions were published. After that year no numbers were given to the successive editions. The latest is the "New Era Edition," which was issued in 1923.

The Pitman system is phonetic, and is geometric in construction. Apart from textbooks, there exists a very extensive library of books written in Pitman's Shorthand.

Many other shorthand systems have appeared since 1837, but none is so widely used as the Pitman system and space will not permit of mention of all of these. Many modifications of the Pitman system were published in America, among them being those of Graham (1854), Munson (1866), Burns (1870), and Williams (1878).

In 1884 J. M. Sloan issued *The Shorthand-Pitman Phonographic Instructor*, an adaptation of the French system of M. Daploye. The alphabet is simple and the system had a fair number of adherents.

Light-Line Phonography, later issued as "*Gregg Shorthand*," *A Light-Line Phonography for the Million*, was published in 1888, the author being John Robert Gregg. The special features claimed for the system are that there is no thickening of strokes, it is written on the slope of longhand, the vowels are joined to consonants in natural sequence, there is no "position writing."

Oxford Shorthand (1889), *The Manual of Eusebia Shorthand* by Alfred Davis (1894).

A System of Lucid Shorthand, by W. G. Spencer (1894), *Easy Shorthand*, by Sir Edward Clarke, K.C. (1907), *Swift Hand*, by the same author (1909), *Lightning Phonography*, by W. A. Stirling (1912), *Shorthand in Three Days*, by R. J. G. Dutton (1916) are among the many other systems put before the public in comparatively modern times.

SHORT-SIGHT. See EYE; MYOPIA.

SHOT. A term formerly used to describe the solid projectiles fired from cannon, but not considered in that sense since the introduction of modern shell. The term is now applied only to the smaller projectiles used in shot guns.

SHOT, PUTTING THE. An athletic contest evolved from the medieval contest of hurling a heavy stone. An iron ball is used, weighing 16 lb.



PUTTING THE SHOT
Photo: Topical

SHOULDER-BLADE. One of the bones of the body. See SKELETON.

SHOVELLER. A kind of duck named from the curious shape of its bill, which is very large, wide and flattened at the tip, and narrower at the base.

The shoveller is a northern native and is fairly common in Britain, where it breeds in marshy districts. Its number is increased in winter by immigrants from more northern breeding-grounds.

SHRAPNEL. A type of shell filled with metal balls, containing a time fuse and bursting charge, which enable the shell to be exploded in the air, when the balls fly forward and sweep a large area. Shrapnel was invented by a British general called Shrapnel, who died in 1840.

SHREW, shroo. These insect-eating mammals are widely distributed in both the eastern and western hemispheres, and are found chiefly in fields, woodlands, and gardens, though some live part of the time in water, and others frequent the marshes. Shrews look very much like mice, though differing in habit. They have long, slender snouts that are extremely mobile, and tiny eyes and ears, and their bodies and tails are covered with dark, short hair. Insects and worms form the chief part of their diet, out

some species feed on young birds and other small creatures of the woods. Weasels, foxes, and owls, prey upon shrews.

Classification. Shrews belong to the family Soricidae and order Insectivora.

SHREWSBURY, shroo' bri. Borough and county town of Shropshire and one of the most ancient and picturesque towns on the Severn, with an area of 8135 acres and a



SHREWSBURY
The Council House Gateway
Photo: G.W.R.

population of 32,370 in 1931. It is situated in a loop of the river so that it is protected by it on three sides and on the fourth by the Castle Hill. In the Border warfare of the Middle Ages it held a distinguished position, when the castle, an eleventh-century building, was the stronghold of Roger Montgomery, Earl of Shrewsbury. Though little remains of the early building (for it has long been converted into a private residence), its old tower is notable for the view it affords of the town. The castle, however, is not Shrewsbury's only claim to antiquity. The black-and-white timbered houses of Butcher's Row and Wyle Cop are among the best in England; and the old market hall is an example of sixteenth-century architecture.

Shrewsbury is the principal market town of Shropshire as well as being the administrative and executive capital of the county.

SHREWSBURY, EARLS OF. An ancient title of nobility held by three Norman barons, Roger of Montgomery, Hugh of Montgomery, his son, and Robert of Bellême. Roger, a kinsman of Duke William of Normandy, fought at Hastings. Later he founded Shrewsbury Abbey and built numerous castles along the Welsh marches. Hugh continued his father's work of subjugating the West, and was killed in Anglesea. Robert of Bellême led a life of armed revolt against William I, William Rufus and Henry I, being an example of the overmighty baron whose power the Norman kings were aiming to subdue. Being finally sent to Henry I as ambassador by Louis of France, he was imprisoned until his death.

The Earldom was granted in 1422 to John Talbot who was succeeded by six descendants, the last of whom died in 1616. The first Earl of the new line distinguished himself in the French War under the Lancastrian kings. He is the Talbot whose prowess is recorded by Shakespeare in Henry V's speech to his troops before Agincourt. Later, John Talbot became governor of Ireland and Earl of Waterford.

The fourth Earl, George, was enriched by the grant of monastery lands by Henry VIII for diplomatic and military services. He was a supporter of the King's reformation policy and was chiefly instrumental in suppressing the rising in the North (1536), known as the Pilgrimage of Grace.

The sixth Earl, George, was entrusted by Queen Elizabeth with the custody of Mary Queen of Scots from 1569 to 1584 at Tutbury, Chatsworth, Sheffield and elsewhere. In this difficult task, which demanded the utmost tact and discretion, since his ward was the centre of disaffection and intrigue, the Earls succeeded to a marked degree.

SHRIKE.

The common name for a large family of birds. The name was originally given to the present-day *great grey shrike*, a bird that breeds in northern Europe and is

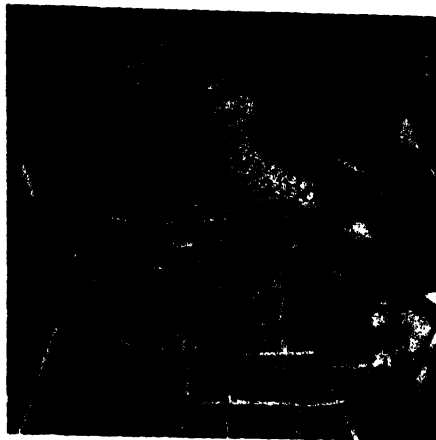


YOUNG AFRICAN GREAT SHRIKE
The bird is on the bough of a thorn bush.

Photo: Cherry Kearton

a fairly common winter visitor to Britain. Shrikes are widely distributed throughout the world but are completely absent from South America. There are several hundred

species. Typically, shrikes have a strong bill, the upper mandible being notched and slightly hooked at the tip. Their food consists of large insects, small mammals, reptiles and birds. Their curious habit of impaling prey on a thorny bush to form a larder in



RED-BACKED SHRIKE

Cock (left) and hen.

Photo: John Kearton

the vicinity of the nest has earned for them the name of "Butcher-Bird."

In Britain the commonest bird of this family is the *red-backed shrike*. It is a summer visitor and nests usually in thorny hedges. The male has a characteristic grey head and white throat with a black streak across the eye, and the back is buff-coloured.

Scientific Name. Shrikes belong to the family *Laniidae*, the red backed shrike is *Lanius collurio*.

SHRIMP. A long-tailed crustacean found in almost all seas. The common shrimp of the North Atlantic is 2 in or 3 in. long. It



SHRIMP

Photo: Walker

has a humped, transparent, greenish-grey body, a pair of long feelers, pincers for seizing its prey, and small paddle-like limbs for swimming. Shrimps like to frequent

shallow waters with sandy bottom, and, when in danger, they hide in the sand. Their flesh is greatly prized for its delicate flavour.



SHRIMPERS WITH HIS NET
Photo Topical

Large numbers are caught in traps or nets, and sold fresh, cooked, or tinned.

Scientific Name. Shrimps belong to the family *Carididae*. The common shrimp of the North Atlantic is *Crangon vulgaris*.

SHROPSHIRE. One of the westerly border counties of England. The total area is 861,800 acres. In 1871 the population was 248,055, but this had shrunk to 244,162 by 1931, owing to the general drift of population to the neighbouring industrial districts.

Physical Features. Shropshire falls naturally into two divisions. South and west of the Severn the county is mountainous and irregular with a relatively large proportion of moorland. To the north and east of the Severn it is a fertile and well-watered plain from which the Wrekin and two or three lesser hills rise abruptly.

In the extreme south-west is the Forest of Clun, a highland region which rises on both sides of the River Clun.

Radiating north-eastward from this upland plateau are three parallel lines of hills, separated by broad valleys. The most northerly is the Stiper Stone range, extending from Hyssington in the direction of Shrewsbury. The next ridge is the Long Mynd. South of this again is the long and imposing line of the Wenlock Edge, which extends in an unbroken line from Craven Arms to Much Wenlock. The most southerly part of the county is occupied by a still more irregular series of hills from which the two summits of Brown Clee and Titterstone Clee stand out.

To the north and east of the Severn is an undulating plain, a region of mixed pasture

and arable. The Wrekin, 1335 ft., is a hill of volcanic origin.

The principal river is the Severn, which flows in a tortuous course in a south-easterly direction from Melverley through Shrewsbury, Wroxeter and Bridgnorth to the Worcestershire boundary. Its principal tributaries are the Vyrnwy and the Tern.

History. Remains of Palaeolithic man are non-existent; those of the Neolithic race exist, but not to such an extent that we can infer from them that the county was peopled thickly at that time. From the fact that most of the flints have been discovered in the south-west mountainous district, whilst the north-east has yielded a greater number of bronze instruments, we may assume that the Severn formed for a considerable time a division between the Neolithic and the later Celtic Kingdoms.

The first Roman invasion did not penetrate this district, the territory of the Ordovices. A partial conquest was affected by Ostorius in the first century A.D., and one large Roman station, Viroconium, was established. Recent excavation has shown evidence of a rather more intensive colonization. After the Roman period, Shropshire marked the division between the Anglo-Saxon kingdoms. The kingdom of Northumbria in its hey-day extended its influence over the whole district. In the seventh century it had fallen into the hands of Mercia, and shortly afterward became part of Wessex. It was in the seventh century, too, that the Britons finally took refuge in the Welsh hills. Evidence of this is offered by the presence of Offa's Dyke, and the fact that place-names of the south-west show a Welsh origin, whilst those of the north-east are principally Saxon. Danesford perpetuates the tradition of Danish incursions, and Bridgnorth appears to have marked the limit of their attacks.

Many legends are told regarding the exploits of Edric, who is reputed to have descended on the Normans and to have sacked Shrewsbury before being compelled to sue for peace. When the division of the conquered territory was undertaken, the greater part fell to the mighty Roger de Montgomery, later Earl of Shrewsbury, whose rule resulted in great agricultural development. The Domesday Survey shows that Shropshire included most of Montgomeryshire as well as parts of Denbighshire, Flintshire and Merionethshire.

The reigns of Henry I and of Stephen are both marked by insurrections. In the former, Bridgnorth was held by the Montgomeries for Robert of Normandy. In the latter, Shrewsbury and Ludlow were held for Matilda. Henry II found it necessary to



SHROPSHIRE

1. Bridgnorth: probably the limit reached by the Danish raiders.
2. Stokesay Castle.
3. The Needle's Eye on the Wrekin, a hill of volcanic origin.
4. Looking from near Bishop's Castle towards Clun Forest.
5. Little Stretton Church.
6. Ludlow from Whitecliff. The castle contains some fine Gothic arches and the nave of its chapel dates from the twelfth century.

Photos: Taylor, George Long

besiege Bridgnorth in his struggle with Hugh de Mortimer. The next century is concerned with the Welsh battle for independence. Llewellyn the Great was Lord of Ellesmere. In 1215 he seized Shrewsbury; again in 1232 he ravaged West Shropshire. The Barons' War, in which in 1263 Simon de Montfort was quartered at Bridgnorth, gave renewed hope to the Welsh, but in 1282 Llewellyn the Younger was slain, and a line of castles was erected, including those at Oswestry and Ludlow. The final incursion of the Welsh took place at the beginning of the fifteenth century under Owen Glendower, and the castles of Clun, Oswestry and Shrewsbury were captured. In 1403 occurred the Battle of Shrewsbury in which King Henry IV utterly defeated the insurgent Percies.

In the Wars of the Roses Ludlow was a Yorkist stronghold, and was the scene of a Yorkist victory in 1459; later the castle was razed by the Lancastrians. In the Civil Wars of the seventeenth century Wellington and Shrewsbury were two of the key towns in Charles I's campaigns of 1642. Among a large number of skirmishes, the most important was the Battle of Knockin Heath 1645, a Royalist victory. The last of the strongholds to fall was Ludlow, in the first days of June, 1646. The present parliamentary representation of the county is four Members returned by the Ludlow, Oswestry, Shrewsbury and Wrekin Divisions.

Communications. Historically, the Severn is the most important means of communication. Together with the Shropshire Union Canal it used to provide an easy means of communication with Liverpool and Birmingham. The roads of the north-east are good, and Shrewsbury is a centre from which first-class roads radiate in all directions.

The railways are operated by the G.W.R.

and L.M.S.R., Shrewsbury, again, being the most important centre.

Agriculture and Industries. The whole of the north-east is an excellent agricultural country, and although more pastoral than arable, it is yet suitable for the production of grain crops. The most important cereal is barley, but oats are extensively cultivated.

The most famous product of the county is its sheep, which are reared from indigenous stock. A hardy moorland breed ranges over the sheep-walks of Clun Forest. Ponies are successfully raised. Dairy-farming is successfully carried on near Shrewsbury, where also there are a few orchards.

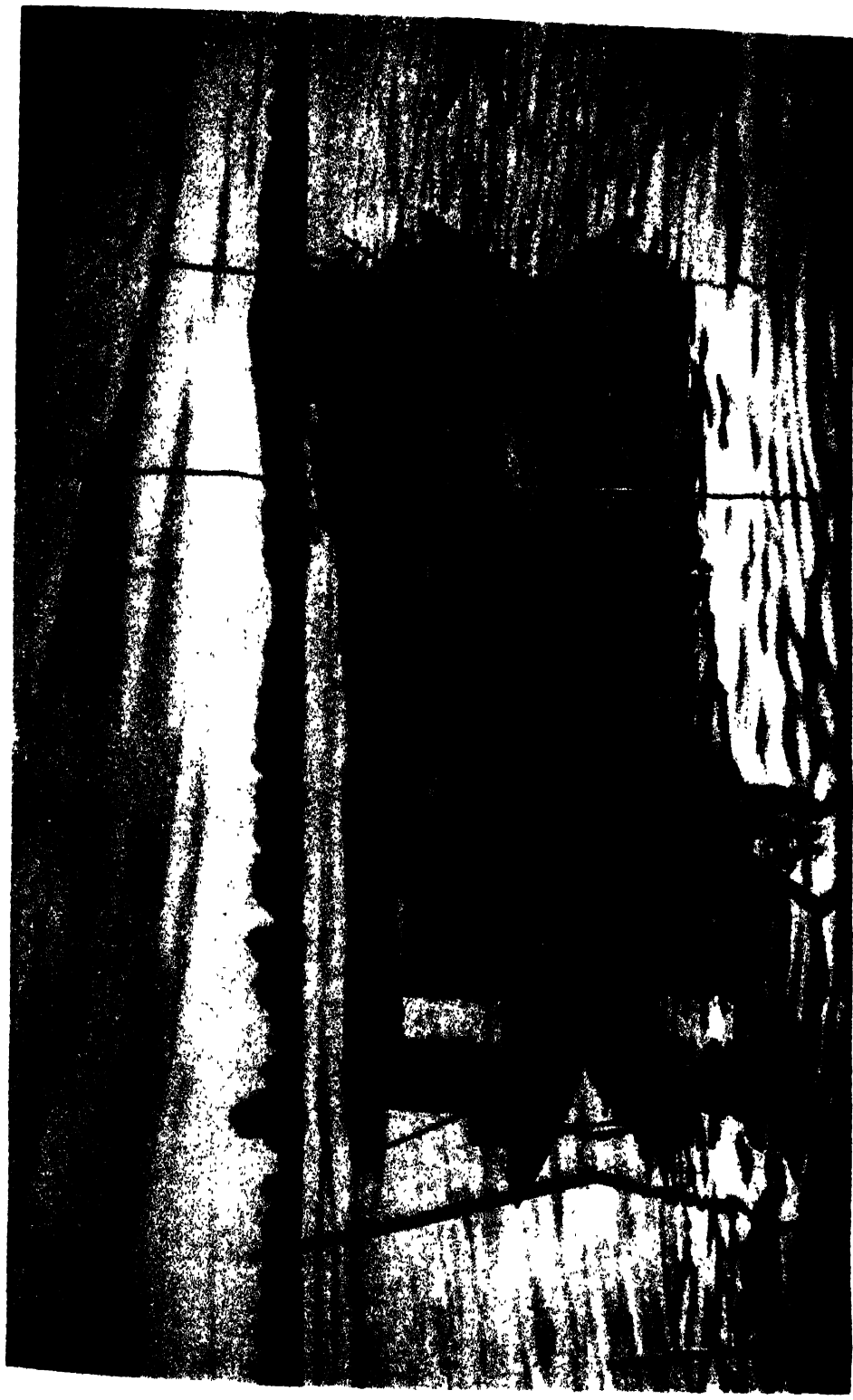
Historically the iron trade is the most important of the manufacturing industries, and was responsible for the rapid increase of population which took place in the middle of the last century. Since the substitution of coal for charcoal, this industry has fallen on bad days,

but remains the largest one. Coalbrookdale and Wellington districts are the principal centres. The coal measures exist in these areas and also near Shrewsbury and Oswestry, and in the so-called Forest of Wyre, in the extreme south-west corner.

Manufacturing industries are few, but the carpet industry of Bridgnorth is of long standing.

Antiquities. Pre-Roman antiquities are relatively few, with the exception of the circular entrenchments of British origin which crown the summits of very many of the hills. Round barrows, also, are moderately numerous. A Celtic lake-dwelling has been discovered on the artificial island which separates Bomere and Shomere. The Bradling stone at Norton is an early monolith, by some considered to be a dolmen similar to the many which are found over the borders of Wales. The most perfect stone circle is that in the Clun district on the Pen-y-wern





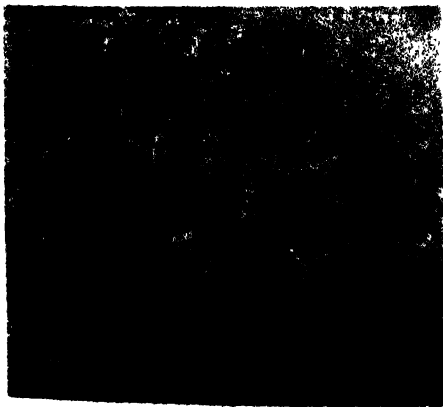
RIVER DWELLING IN SIAM

Stapeley Hill, also, shows remains of another circle, originally of larger size. The finest of the early British camps is that known as Coxwall Knole, near Bucknell, in the extreme south. Norton Camp is one of the finest square camps in the country, and is possibly of Roman origin. The remains of the station of Viroconium are unfortunately no longer *in situ*.

The most notable medieval castle, Ludlow, contains some remarkable Gothic arches. The nave of the chapel is late twelfth century. Of the former numerous abbeys and priories the best remains are at Shrewsbury.

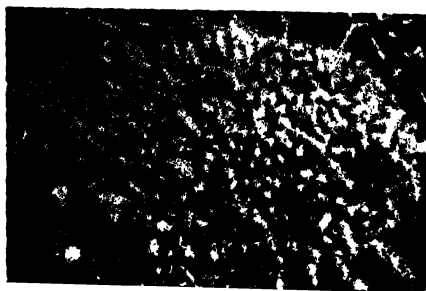
Principal Towns. The county town is Shrewsbury (which see). The other boroughs are *Bridgnorth*, area 2822 acres; population 5151 in 1931, the centre of a carpet industry; *Ludlow*, area 420 acres; population 5642 in 1931, in some ways the most picturesque town in the county, for in addition to the noble ruins of Ludlow Castle it contains a decorated cruciform church of fine proportions, and several ancient inns, *Wenlock*, area 22,657 acres; population, 14,152 in 1931, containing the ruins of a priory founded in the eighth century, *Bishop's Castle*, area 1867 acres, population 1352; and *Oswestry*, area 1887 acres, population 9754, an ancient town with an agricultural trade and railway workshops.

SHROVE TUESDAY. The day before Ash Wednesday, which is the beginning of the Lenten season. It was so called from the old custom of confessing or receiving *shrift* on that day. At the present time, in many countries and communities, it is a great festival of rejoicing, preceding the penitential season. It is the *Carnival* of the Italians, the *Mardi Gras* of the French, and the *Pancake Tuesday* of England.



GORSE IN BLOSSOM
Photo: E. J. Hocking

SHRUB. The name applied to a class of plants with woody stems that grow erect. They differ from herbaceous plants in having



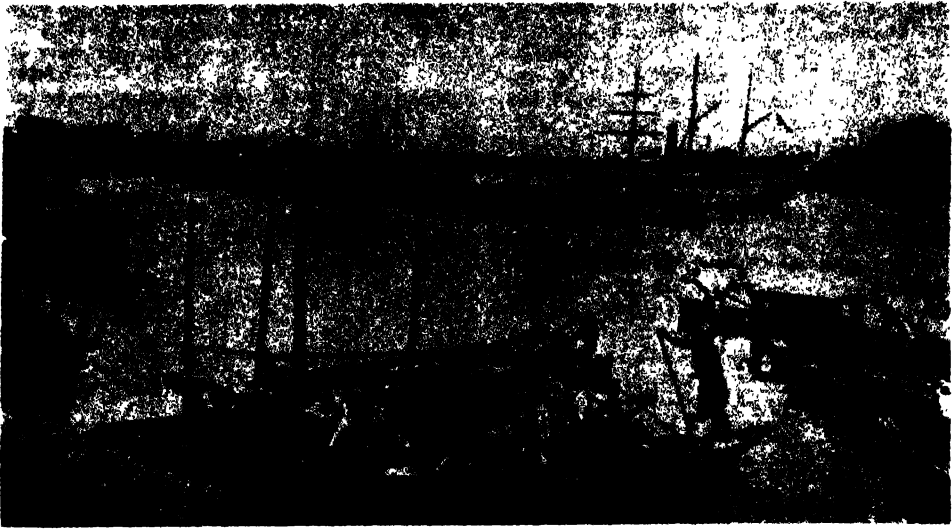
DWARF GORSE
Photo: E. J. Hocking

woody tissue, and from most climbers or ramblers in being self-supporting. Shrubs differ from trees in being of smaller height; shrubs, too, often have several stems of equal importance, while trees ordinarily have one self-supporting trunk.

SHUFFLEBOARD. A game in which weights are pushed along a board, table, or floor, with the hand or a staff, the object being to place the weights in certain compartments outlined on the board. Two or four persons may play, the sides taking position at opposite ends of the board. In the indoor game, lines forming 5 in. squares are drawn across a sand-sprinkled board which is 30 ft. long. The line which is drawn about 5 in. from each end of the board is called the *deuce* line. The players slide the pieces in rotation, each being allowed to shove his opponent's weight off the board, or to push his partner's piece into a more advantageous position. If a piece is left projecting over the edge of the deuce line, three points are counted for the player. If it rests between the finishing line and the edge, or on the line, two points are counted. If no piece is inside the line, the one nearest to it scores one. A side first making twenty-one points wins.

SIAM. An independent kingdom of the Indo-Chinese peninsula. It is called by the natives *Muang Thai*, or the *Kingdom of the Free*. The greater part of the country is bordered by the British province of Burma and by French Indo-China. Lower Siam is that part of the Malay Peninsula extending as far as the Federated Malay States. The total area of the kingdom is 108,188 sq. miles.

The People. The estimated population in 1935 was 13,206,000. The Siamese are a Mongoloid race related to the Shans of Burma. More primitive tribes live in the



SIAM'S PRINCIPAL RIVER
A scene on the Chao Phraya (Menam) at Bangkok.
Photo. OROC

northern part of the kingdom. There are about 500,000 Chinese.

The typical Siamese is of medium height, olive complexion, fairer than the Malay. There is no distinction of caste.

The chief town is BANGKOK, a city of islands, canals, and floating houses. It is situated on both banks of the river Menam, and on islands formed by its numerous branches.

Many houses are built high upon poles or on piles, to escape the floods due to the extremely low surface of the land, but in its modern portion, Bangkok is a clean city, with efficient drainage and lighting systems. It handles 85 per cent of the foreign trade of Siam. The exports consist chiefly of rice, sugar, silk, cotton, tobacco, pepper, sesame, ivory, hides, and teak. Population, about 700,000 (1929).

Religion. The Siamese are orthodox Buddhists, but there are many followers of Mohammed and Confucius and a few Christians.

Education. Much of the education is in the hands of Buddhist priests. All of the royal monasteries, government schools, hospitals, and a Pasteur Institute are in charge of the Minister of Public Instruction. Elementary education is compulsory and generally free. The University of Bangkok was established in 1917.

Land and Climate. In the north Siam is a rugged country of hills rising to 6000 ft and narrow valleys widening towards the south. The hills are forested but the valleys are cultivated. The east is a shallow basin of indifferent fertility and much swamp. The centre is the great valley of the River Menam. This great water-



THRONE HALL OF THE KING OF SIAM
The building was designed and decorated by Italians.
Photo. OROC

way flows in a south-westerly direction; in its valley, which covers some 50,000 sq. miles, the largest part of the population lives. Almost as much as in Egypt, the welfare of millions depends upon flooding by the country's great rivers. The Nam-Mun, Tachin, and Mekong are also important streams. Lower Siam is mountainous and wooded.

The climate is tropical and of great humidity. There are three seasons—the cold season, from November to January; the hot season, from February to May; and the rainy season, from June to October.

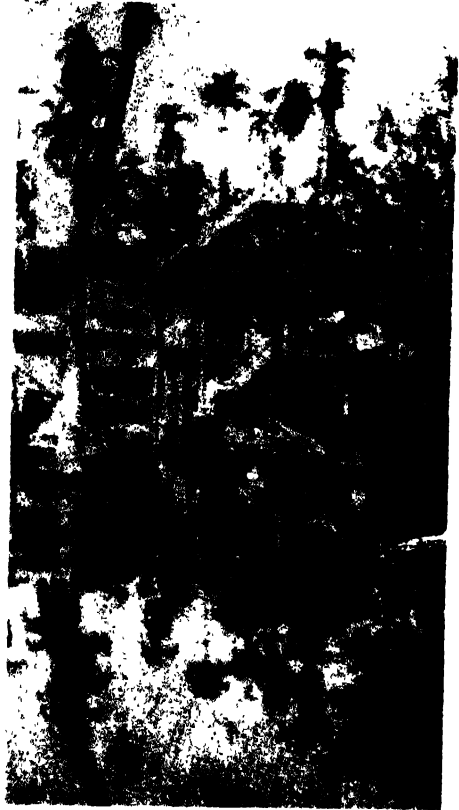
Industries and Resources. Over 35 per cent of the area is under crops. Practically the whole population of Central Siam, out-

zinc, manganese, antimony, sapphires, rubies, other precious stones, and coal are found in some of the provinces.

Transport and Communication. Modern means of transport are replacing the elephant, coolie, and ox-cart; however, there are over 8800 tame elephants in Siam, and all of these are labourers. The rivers are



WASHING CLOTHES IN A CANAL
A typical scene in Siam
Photo: OROC



SIAMESE NATIVE DWELLINGS
Built on piles for protection against flooding.
Photo: OROC

side of Bangkok, is occupied in rice-growing. The annual production is 4,000,000 to 5,000,000 metric tons. Rice is the national food, and accounts for 85 per cent of the exports. Many fruits are abundant, including the mango and mangosteen. Other crops are pepper, tobacco, hemp, maize, spices, and cotton. An increasing amount of rubber is grown in the far south. The teakwood lumber trade, in Northern Siam, and cattle-raising are important. Siam's mineral resources are varied, but, with the exception of the mining of tin in Lower Siam, they are not extensively developed. Gold, tungsten,

important commercial highways. There are 1900 miles of railway. A line connects Bangkok through the length of the Malay Peninsula with Penang and Singapore. To the north a line continues to Chiang-mai. Modern highways are replacing unimproved roads.

There is an important aerodrome just north of Bangkok.

Government. The government is a constitutional monarchy, and the crown is usually hereditary, the king having the right to appoint his successor. In June, 1932, a Constitution signed by King Prajadhipok

replaced his absolute monarchy. The legislature, according to the Constitution, is composed of a Senate and a Senate Executive Committee of fifteen members. The committee controls all legislation, in that any measure suggested by the king must be approved by a member of this committee, and measures vetoed by him may become laws if passed by the entire Senate. In 1934 the king left Siam and in 1935 abdicated because of the non-recognition of certain of his monarchical rights. He was succeeded by his cousin Ananda, a boy of nine.

History. No coherent account of events previous to 1350 is obtainable. That date marks the founding of the city of Ayuthia as the capital, and the accession of the first supreme Siamese king. The acquaintance of the Western world with Siam dates from the early sixteenth century, when Portuguese traders visited the country. In the seventeenth century, commercial relations with the Dutch, English, and French were established. During this period, Siam was almost continually fighting neighbouring tribes to maintain its independence, and in 1767 Ayuthia was taken by Burma. A period of anarchy followed, until a Chinaman, at the head of bands of freebooters, was successful in driving out the Burmese. He set himself up as king under the name P'hya Tak, and established Bangkok as the capital. After a brief reign, during which he subdued most of the northern provinces, the military leader of the country, Chao P'hya Chakki, took over the rule, founded the present dynasty, and built the modern city of Bangkok.

The beginning of the nineteenth century marked an era of territorial expansion, and the re-establishment of political relations with Western nations. In 1826 Great Britain and Siam signed a treaty of commerce and friendship.

In 1855 Great Britain made a new treaty with Siam, which established extra-territoriality and put trade relations on a safer basis. Other powers made similar arrangements between 1856 and 1868.

France began its encroachments on Siamese territory in the 1880's, though it was not until 1893 that it began an open attack. In that year, the French took possession of the territory east of the Mekong river and a wide belt to the west. From 1896 to 1899, France and Great Britain marked out spheres of influence for themselves. Disagreements between the French and Siamese resulted in the loss of further territory to the French in 1899, and again in 1902. Five years later, a new treaty with France brought added cessions. Great Britain gained 15,000 sq. miles of Siamese territory by a treaty in 1909, when the states at the southern part

of the peninsula—Trengganu, Kedah, and Kelantan—were ceded. In return, Great Britain modified the extra-territorial rights of British citizens, and advanced £4,000,000 for railways in Southern Siam. Extra-territorial rights were relinquished by Great Britain in 1926.

In July, 1917, Siam declared war against



TEMPLE OF THE EMERALD BUDDHA

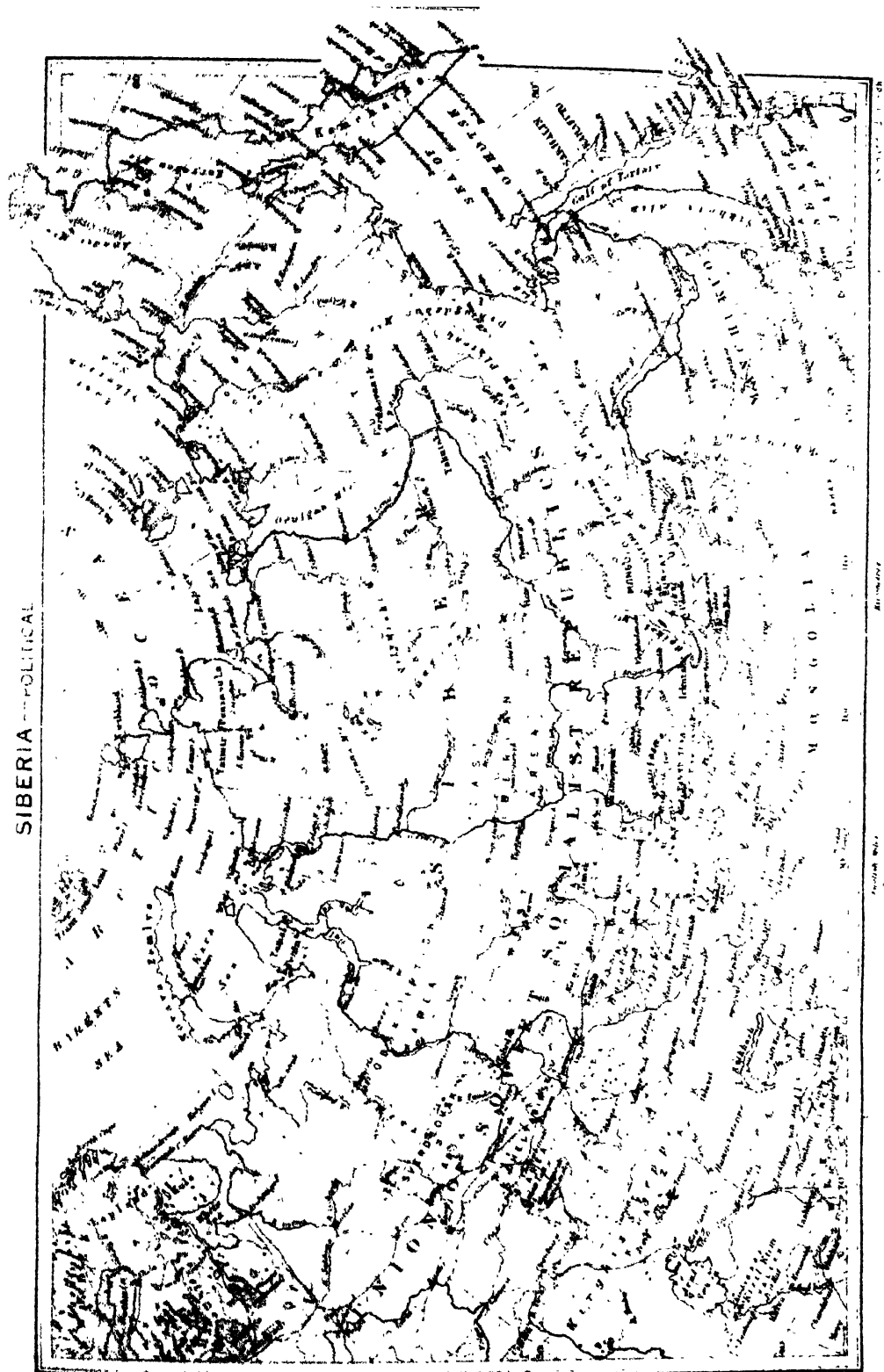
It is in the grounds of the Palace at Bangkok. One of a number of guardian lions is in the foreground.

Photo: QROC

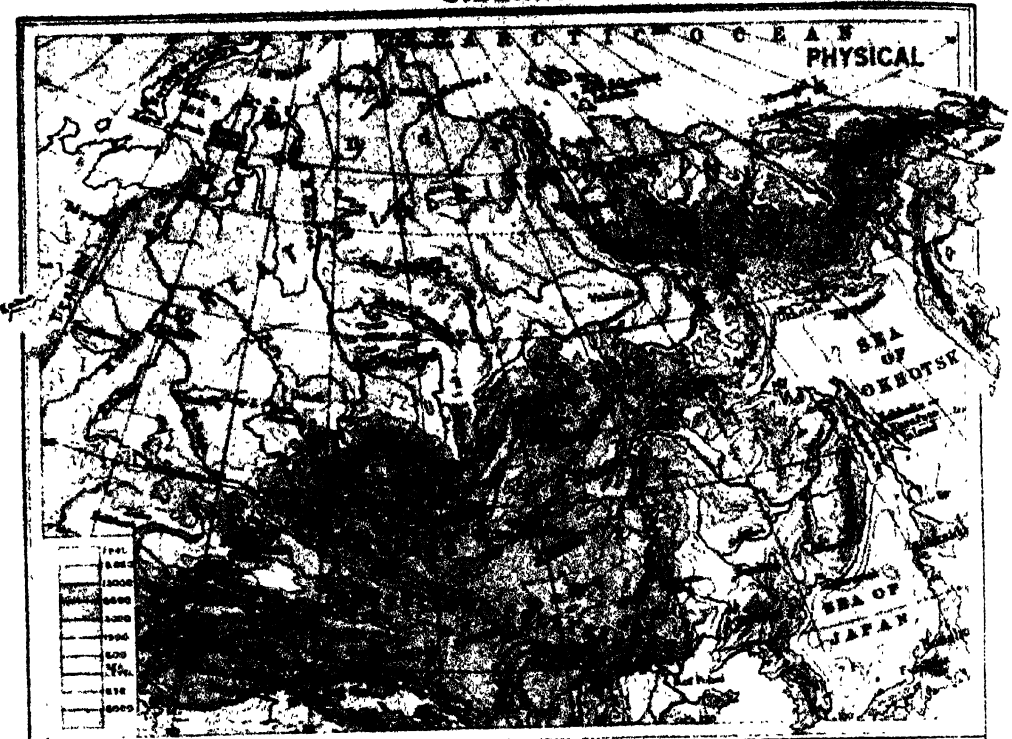
Germany and Austria and seized nine vessels of the Central powers. In October, 1928 a treaty of friendship with Germany was signed. Siam is a member of the League of Nations.

The revolution of June, 1932, broke the power of the old princely families. The People's party, a new group of young progressives in both civil and military life, was officially responsible for the Constitution of 1932.

SIBERIA -- POLITICAL



SIBERIA



SIBELIUS, *sib ay' lius*, JEAN JULIUS CHRISTIAN (born 1865). A Finnish composer, born at Tavastehus. His father was a Finnish country landowner and his mother, a Swedish gentlewoman. Although he studied in Berlin and Vienna, Sibelius' music was not much influenced by European composers, but shows a remarkable originality. He has composed symphonies, orchestral works, and songs. His tone poem *Finlandia* is very popular; but the bulk of his work is marked by an austerity of style whose greatness has only recently gained wide recognition. His symphonies are very closely organized, original yet in touch with tradition, and are by many felt to be the most promising products of modern music.

SIBERIA. An integral part of the Russian Soviet Federated Socialist Republic, consisting of the Obi-Irtysh area, Chelyabinsk area, West and East Siberian areas, Far Eastern Republic, Yakutsk Autonomous Republic and Buriat-Mongol Autonomous Republic. The names and extent of these divisions are liable to changes. The total area is about 5,000,000 sq. miles.

The People and Cities. The Siberian region has a population of about 20,000,000 inhabitants. The country in general is sparsely settled, vast areas in the Arctic regions being almost uninhabited. The majority of the Russians are immigrants, or children of immigrants. The remainder of the population consists of Ugrian and Mongol tribes.

Once transport is extended, an immense area will be available for settlement, agriculture, mining, lumbering, and fishing.

Omsk, on the Trans-Siberian Railway, is the gateway between European and Asiatic Russia. The climate, though dry and fairly mild, is marked by severe snowstorms and sandstorms. Population, 227,000 (1926).

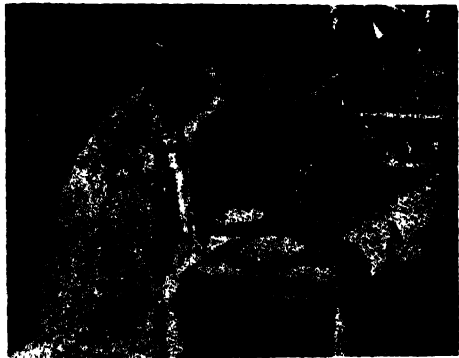
Irkutsk, about forty miles from the southern end of Lake Baikal, is on the Trans-Siberian Railway. It was settled in 1686, growing out of a fur-trading station. There is a university. Irkutsk is an important trade centre, because it is the meeting-point of several caravan routes to China and of the Trans-Siberian Railway. Population, 158,500 (1933).

Novosibirsk, on the River Ob, is on the Trans-Siberian Railway. It is the capital of the Western Siberian Area, but its recent development is due to the Kuznetsk coal-field. Population, 294,000 (1933).

Tomsk, on the River Tom. Gold was discovered in the vicinity in 1824. To-day it is an educational centre with a university, and one of the important manufacturing cities of Siberia. Porcelain, refined sugar, flour, iron wares, and carpets are made. Population, 128,400 (1933).

Vladivostok, in the Far Eastern region, is the most important Siberian port on the Pacific. The harbour is frozen about three months of the year, but can be kept open by ice-breakers. Population, 190,000 (1933).

The Land and its Climate. In the west and north-west there is a vast area of low-lying plains rising gradually from sea level to about 2000 ft. in the south-east. Eastward the ground rises and becomes more rugged, and Central Siberia is a land of plateaux scarred by deep and wide river valleys. In the south lie the mountains of Altai and Sayansk of 3000 to 6000 ft. The far-east of Siberia is marked by great block ranges rising to 3000 or 4000 ft. and extend-



NATIVE OVEN IN WESTERN SIBERIA
Photo: OROC

ing mainly south-west and north-east. Between them lie areas of plains crossed by large rivers. Kamchatka is an outlying mountainous peninsula. Much of Siberia is inadequately explored.

Four great river systems—the Ob, Yenisei, Lena, and Amur—form a network over the land. Lake Baikal (area of 13,200 sq. miles), is the largest fresh-water lake in Asia.

Siberia is known for its long, cold winters. Not even in North Polar regions does the temperature fall so low. In North-east Siberia temperatures of -90° have been recorded. Excepting along the Pacific coast, the rainfall is light.

Agriculture and Forests. The best agricultural districts are the south-western area and the Amur valley. Some 24,000,000 acres of Siberia are cultivated.

Wheat, oats, and rye are the chief crops, although potatoes, beets, peas, beans, barley, flax, and other cereals and fibres are grown. Strawberries, blackberries, raspberries, and cranberries grow well.

Livestock farming is carried on, but the stock must be housed and fed during long

winters. Sheep and pigs are more important. There is also much soft timber.

Dairying is an important industry.

Minerals and Mining. Siberia is rich in minerals, but owing to meagre transport the mineral industry made little progress until recently. Coal, iron, gold, silver, lead, zinc, copper, manganese, tungsten, sulphur, asbestos, petroleum, sodium, iridium, and platinum are but a few of the minerals to be found in the country. There are immense coal deposits but little oil. Iron ore is widespread, and is now being mined. The Kuznetsk region in Western Siberia is the chief coal and iron district.

The forests of Siberia cover over 1,000,000 sq. miles. See RUSSIA.

SIBYL, *sib' il*. In Greek and Roman mythology, a prophetess inspired with the power of prophecy, the gift of Apollo. The most famous of these seeresses was the Cumaeen sibyl, who, so the story goes, appeared before King Tarquin the Proud and offered him nine prophetic books for sale. This offer he refused, and a second offer, after she had destroyed three books, was also declined. When she appeared before him the third time, with but three books left, he bought them, paying the price she had asked for the nine. These three books were kept in the temple of Jupiter, and when it was burned in 83 B.C. they

were likewise destroyed. The sibylline literature was consulted when it was deemed necessary to conciliate the gods.

SICILIES. KINGDOM OF THE TWO. See NAPLES, KINGDOM OF.

SICILY. An island in the Mediterranean Sea, separated from Italy, of which it is politically a part, by the Strait of Messina. With an area of 9935 sq. miles, it is the largest island in the Mediterranean. At the census of 1931 it had a population of 3,896,866. In past geologic ages, Sicily was a part of the mainland, and is a continuation of the Apennines, with the volcanic Mount Etna (10,740 ft.) in the north-east. Most of the island is hilly, but there are plains in the south and the fertility is great. Sicily has a warm climate with winter rainfall.

The mountain slopes and foothills are covered with lemon, orange, and olive groves and with vineyards, and on the plains and lower slopes cereals are raised. Deep-sea fishing furnishes tunny fish, sardines, coral, and sponges, and great quantities of sulphur are mined. Sulphur, fruits, vegetables, salt, wine, oil, and fish are the chief exports.

The first settlers in Sicily, probably invaders from Italy, were conquered by the Greeks, who founded colonies—Naxos, Syracuse, Agrigentum, and others—and introduced Greek culture into the island.



THE HARBOUR AT PALERMO, SICILY
Monte Pellegrino is in the background.

Photo: L. & U



FAORMINA, ON THE COAST OF SICILY

Everywhere in Sicily to-day the traveller finds traces of that Greek civilization—the crumbling ruins of temples and tombs, with their sculptured marbles and friezes. As each of three great empires of antiquity grew into power, Phoenicia, Carthage, and Rome, it included Sicily in its conquests. The Goths and Vandals, barbarian hordes from the north, drove the Romans out of Sicily, to be themselves driven out when Belisarius conquered the island and annexed it to the Byzantine Empire. Byzantine rule was replaced by Saracen, and that in turn by Norman. For a continuation of the history of Sicily, see NAPLES, KINGDOM OF

Sicily has several large towns—

Catania, on the lower slopes of Mount Etna, has repeatedly been visited by earthquakes and has been partially buried under lava from Etna's eruptions. It was of importance in Roman times. Silk is manufactured. Population, 227,765 (1931)

Messina, on the Strait of Messina, is an important commercial centre, noted for its exports of fruits, wines, and silk, linen, and damask. The city was supposed to have been founded in the eighth century B.C. by pirates. About 500 B.C. it was a well-known Greek colony.

Messina was the cause of the First Punic War, at the end of which it came into possession of Rome. The town of Messina suffered in the French and Spanish War of 1671-1678, and by plague in 1743. In the disastrous earthquake of 1908 it was totally destroyed, but was at once rebuilt. Population, 182,508 (1931)

Palermo, on the north-western coast, is the island's largest city. It dates back to the Phoenicians. When Carthage was a world power, Palermo was its stronghold in Sicily.

Fisheries are extensive, and the town exports fruits, oils, and wine. Population, 389,699 (1931)

SICKERT, WALTER (RICHARD), R.A. (born 1860). Painter and etcher, President of the Royal Society of British Artists since 1926, eldest son of Oswald Sickert, painter. He was made A.R.A. in



WALTER SICKERT
Photo: Fox

1924 and R.A. in 1934 but resigned the following year. He is a member of the *Société du Salon d'Automne*, of the Society of Twelve, and of the Allied Artists Association. His works have been purchased by the British

Museum, the Tate Gallery, the Bibliothèque Nationale, the Luxembourg, Manchester and Johannesburg Art Galleries, and the Contemporary Art Society. He championed Epstein in the 1935 controversy over the statuary adorning the former B.M.A. home in the Strand, when the Royal Academy declined officially to join in the protest against the proposed removal of the statues; hence his resignation. *The Raising of Lazarus*, exhibited in 1932, is a characteristic work.

SIDDONS, SARAH KEMBLE (1755-1831). The most celebrated actress of her time, she was born at Brecon, Wales. When she was eighteen years old she married William Siddons, and the couple played in various country towns. Mrs. Siddons first attained fame at Cheltenham in 1774. Some members of the nobility attended her performance there of *Belvidera*, in Otway's *Venice Preserved*, and recognized her ability. Through them, she was engaged by David Garrick, manager of Drury Lane Theatre. In 1782, as Isabella in Southerne's *Fatal*



MRS. SIDDONS
Photo: Brown Bros

Marriage, she achieved one of the greatest triumphs ever seen in a British theatre.

SIDEREAL, *sid' er al*, **TIME**. Time measured by the apparent motion of the stars: a *sidereal day* is the time taken by the earth in revolving once on its own axis. Astronomers consider a sidereal day as the time between the passage of the vernal equinox across the meridian and the instant of its next passage, amounting to 23 hours 56 minutes 4.091 seconds. A *sidereal year* is the period in which the earth revolves once around the sun, or in which the sun apparently completes its revolution, returning to the same place in the heavens. The length of the sidereal year is 365 days 6 hours 9 minutes 9.54 seconds. See **TIME**.

SIDERITE, *sid' er ite*. In geology, a carbonate of iron, also known as chalybite, forming a valuable source of iron. Also a general name for meteoric irons composed almost wholly of iron and nickel. Meteorites composed of both nickel-iron and a large proportion of silicates, such as bronzite and olivine, are known as *siderolites*.

SIDNEY, ALGERNON. See RYE HOUSE PLOT.

SIDNEY, SIR PHILIP (1554-1586). An accomplished British courtier, poet, and soldier. As he was the nephew of Dudley, Earl of Leicester, his career at court was assured, and he was



SIR PHILIP SIDNEY
Photo. Brown Bros.

most favourably received by the queen. Offending her, however, by his outspoken objection to her proposed marriage with Henry, Duke of Anjou, Sidney was compelled to retire from the court for a few months, during which he wrote his *Arcadia* and various poems for the entertainment of his sister, the Countess of Pembroke.

While serving as Governor of Flushing, in the Netherlands, Sir Philip was mortally wounded at the Battle of Zutphen. As he was being borne off the field, he complained of thirst, and water was brought to him. Seeing the wistful look on the face of a mortally wounded soldier, Sidney handed over the water, saying simply, "Thy necessity is greater than mine."

Sidney's poetry, though full of the extravagant fancies of the time, possesses considerable beauty.

SIDON, *si'don*. See PHOENICIA.

SIEGE, *sej*. A military term derived from the Latin *sedere*, "to sit." Literally, a siege consists in stationing an army before a defended place for the purpose of taking it by assault or by starving it into surrender. The first object of the besieging force is to invest or surround the position, to prevent outside help or supplies from reaching the besieged. Artillery is placed at important and commanding positions, and the attackers advance openly to the assault, or from trench to trench dug parallel to the works of the enemy.

Modern Siege Methods. Modern siege tactics have undergone considerable change since the Russo-Japanese War. In reducing a city by artillery fire, called *bombardment*, special guns are used, more powerful than those with the army in the field. For siege purposes, heavy howitzers, or mortars, of 10 in. to 16 in. calibre, and long 6 in. siege guns have been adopted. The big siege guns introduced by the German army in 1914 had an effective range greater than any previously known, and proved that, however

well protected a position may be, the weight of metal will eventually batter down the defences. The fortress of Verdun was the only one that withstood the German bombardment.

Famous Sieges. The most famous recent sieges are those of Paris (Franco-German War), 1871; Plevna, Bulgaria (Russo-Turkish War), 1877; Mafeking, Cape Colony (Boer War), 1899-1900; Port Arthur, Manchuria (Russo-Japanese War), 1904-1905; Przemyśl, Poland (World War), 1914-1915; Verdun, France (World War), 1916. In the first stage of the World War, in 1914, the siege of Antwerp was characterized by none of the former principles of siegecraft. Weight and numbers and heavy howitzers, used by the Germans, quickly overpowered the besieged, and Antwerp was taken in eleven days, whereas, by former siege methods and appliances, six months might have been required.

SIEGFRIED, *sej' freed*. See NIBELUNGEN-LIED.

SIERRA LEONE, *le o' ne*. British colony and protectorate on the west coast of Africa, founded in 1791 (after an unsuccessful first attempt in 1787) by a group of English philanthropists, as a refuge for fugitive negro slaves. The peninsula of Sierra Leone and a few islands constitute the colony and have an area of about 256 sq. miles. The protectorate has an area of 27,670 sq. miles. The total population is about 1,750,000, who are mainly negroes and Mandingoes with about 400 Europeans. The land rises from the low coastal plain to the interior, reaching 6000 ft. in the Futa Jalon plateau in the north-east. The climate is warm. Heavy rain falls from May to October and little for the rest of the year. The wet season is unhealthy.

The natives grow cassava, ground-nuts, rice and bananas for food, and cultivate the oil-palm and kola-nut for export. Cotton is being tried, but coffee is not successful. There is some trade in mahogany and other hard woods.

FREETOWN, the capital city, is the most important seaport in West Africa. It has an excellent harbour, and is one of the principal West African coaling stations. A railway extends inland from the city and crosses the colony. The population of Freetown is 55,000 (1931).

The colony and protectorate are under a governor and executive and legislative councils. There are a number of missionary and government schools. Sierra Leone was named by the Portuguese in 1462, and an English trading station was founded in 1690. Britain took control in 1807 and proclaimed a protectorate over the interior in 1896.

SIEYÈS, *se' yay*, ABBÉ EMMANUEL (1748-1836). French statesman of the Revolutionary period, who became widely known through his pamphlet *What is the Third Estate?* Elected to the National Assembly, he voted for the death of Louis XVI. Later he drew up an ideal constitution which was embodied in Napoleon's "consulate," but through an intrigue with the Jacobins his influence declined.

SIGEBERT, *sig' e bert*, KING OF WESSEX (died 757). Only a year after he had succeeded his kinsman Cuthred he was driven from the throne by Cynewulf. He is said to have ruled harshly and to have flouted the laws.

SIGHT. Details of the structure of the eye have been given elsewhere and need not be repeated here (see EYE). However, the main features of this structure must be kept in mind in considering visual sensations.

When we look at an object, we adjust the lenses of our eyes in such a way that an image of the object falls upon the retina of each eye. In short-sighted people the image tends to fall in front of the retina, in long-sighted people to fall behind it. Correction by glasses is necessary in order to prevent excessive strain on the eyes and to produce the clear images received in normal vision.

Besides adjusting the lenses, we turn our eyes slightly in looking at an object, so that the image in each eye falls upon the fovea. If a pencil is held at arm's length in front of a person and he is asked to watch it as it is gradually brought nearer to him, his two eyes may be seen to converge as the pencil approaches, until in the end he is squinting unmistakably. The image of the object looked at or fixated falls, then, on the fovea of each eye, and we have the power of combining these foveal images in the two eyes in such a way that we see only one object. The same is not true of images formed on other parts of the retina. One of the effects of alcohol when taken in excess is to reduce the power of co-ordinating the eyes so as to bring the images in each on to the fovea. Thus the inebriate "sees double." He may actually see two images, though more often he will see objects with blurred outlines.

In our ordinary vision the use of the two eyes helps us very much in judging depth and distance. This would seem to be partly on account of the fact that only the things that we are actually fixating give clear images, objects nearer or farther than this being seen somewhat blurred. The movements of convergence of the eyes may also give clues as to depth.

Incidentally, the possession of two eyes does away with any inconvenience that might arise from the blind spot.

Not all parts of the retina are equally sensitive to colour. Shades of grey (black, white) can be distinguished everywhere except on the blind spot. All colours can be distinguished if they stimulate the central part of the retina. However, on a region surrounding the central part, reds and greens of ordinary intensity are not distinguishable and are seen as greys. Towards the periphery yellow and blue also fail, and here all colours are seen as grey. It will be remembered that the arrangement of the rods and cones varies in different parts of the retina, and this fact is certainly connected with the varying sensitivity to colour.

The pairing of red and green and of blue and yellow that we have just seen is found in other phenomena as well. These pairs are known as complementary colours. If a patch of red light is thrown upon a patch of green light, the resulting sensation will be one of grey. The two colours cancel one another out as it were. The same is true of blue and yellow. In about 4 per cent of the male population and in less than 2 per cent of females, there occurs what is known as red-green colour-blindness. By these people reds and greens are seen as greys. A much rarer condition is blue-yellow colour-blindness. In some few people there is blindness to all colour and only differences in intensity of light—shades of grey—can be distinguished. See EYE, OPTICS.

SIGHTS As applied to a gun or other firearms, *sights* mean the apparatus by means of which the weapon is directed at the target. *Sights* usually consist of a foresight and backsight, the former being some kind of bead or blade projection at the muzzle end of the piece, the latter a metal bar, fixed at the breech end of the barrel and containing an aperture in the shape of a V, U, or O. If the weapon is correctly laid, an imaginary line—known as the *line of sight*—from the eye of the firer to the mark should pass through the centre of the aperture and immediately above the top of the foresight.

As the force imparted by the explosion of the charge diminishes, the projectile drops below the line of sight and would fail to reach the target, unless the muzzle of the weapon is raised. This tendency is overcome by making the backsight in two pieces, a bar marked with the ranges in yards or metres, within the capacity of the weapon, and a slide containing the notch or aperture through which aim is taken. As the distance to the target increases, the slide is moved

up the bar to the correct range, and when aim is taken the muzzle of the weapon is thus raised enough to enable the projectile to hit the target.

In modern big guns, elevation is given by machinery, and telescopic sights, which remain aligned upon the target independently of any movement of the gun, are used.

In a shot-gun, there is no backsight and a small bead represents the foresight.

The pressure of the wind is met by a milled screw, which traverses the slide to either side.

SIGILLARIA, *sij il air' ia*. A fossil tree found chiefly in the upper carboniferous rock but extending from the Devonian to the Permian. Sigillariae are the chief constituents of some coal seams and are therefore considered to be the most important genera of Palaeozoic plants. They were large trees with straight, or dichotomously branched, trunks bearing leaves and fructifications known as sigillario-strobilus. Their roots were not at first recognized as such and were given another name.

SIGISMUND, *sudj' iz mund*, HOLY ROMAN EMPEROR (d. 1437). He belonged to the house of Brandenburg, becoming margrave at the age of ten. By marriage he acquired the throne of Hungary and in 1410 was elected to succeed Rupert III as Emperor. Through his influence Pope John XXIII was persuaded to hold a General Council of the Church at the imperial town of Constance in order to heal, if possible, the schism which at that time divided the Church, whose allegiance was claimed by three rival Popes. Sigismund's treatment of John Huss, the leader of the religious reform movement in Bohemia, is regarded as a shameful episode in the life of the Emperor who, pledging Huss a safe-conduct, afterwards abandoned him to his fate. Huss was convicted of heresy and burned at the stake.

Sigismund, after the Council, travelled through Christendom in an endeavour to bring about a pacification among the nations which were torn with religious dissension, but his efforts were of little avail. Brave and handsome in appearance, a great orator, and with some pretension to scholarship, he suffered from defects of character that made him an ineffectual leader.

SIGNALLING AND SIGNALS. Signalling is the art of conveying messages by means of audible or visible signs, the significance of which is pre-arranged.

Marine Signalling. Very early, it is believed, the Venetians devised means of conveying short messages to other vessels or land posts within their field of vision, but beyond the sound of a megaphone. Flags of various shapes were used, and later, lanterns, lights, and sound signals. But

ships remained cut off from the world when beyond sight or hearing of other vessels, until the wireless telegraph was invented towards the end of the nineteenth century.

Wireless, however, has not displaced all other marine signals. Nearly all the signals worked out use some adaptation of an international code, so that sailors of all nations may read the meaning and communicate intelligence.

In 1817, the Marryat code, invented by the famous British sailor-author of that name, was adopted and became the first really international code. Changes and improvements in code were frequent, but the international code set up in 1889 failed so badly in the World War, that the British proposed that a new book should be compiled by the International Radio-telegraph Conference held in Washington in 1927. This Conference decided that the British Government should be asked to undertake the construction of a new code. The new code consists of twenty-six letter flags, ten numeral pendants with three substitutes for the more frequent numbers, and a code and answering pendant. The code or answering pendant is hoisted to announce the beginning of a flag message and to indicate that the message is understood. The code was completed in two years and issued in 1930.

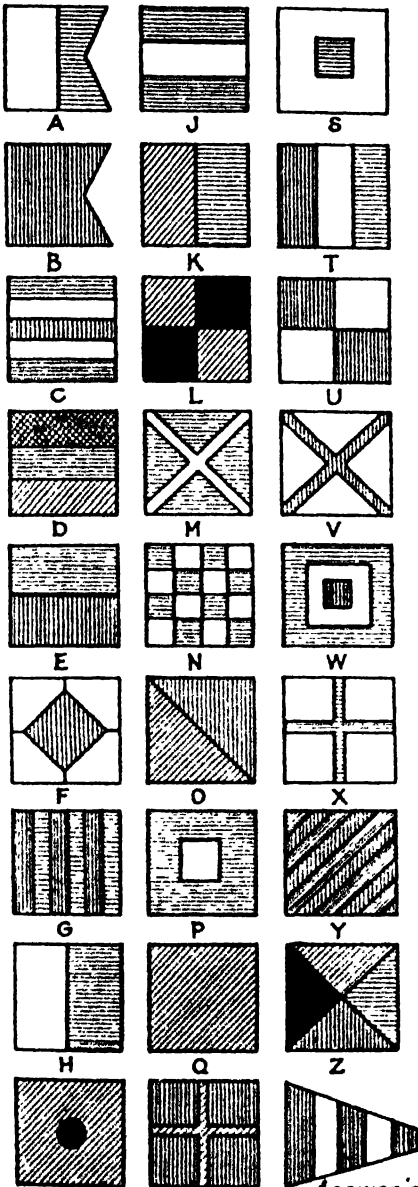
The signal flags are hoisted singly, or in combinations of from two to four. The messages most used require only one flag, which may indicate such phrases as "ship is in quarantine," or "pilot wanted." Two flags are used for urgent and important messages, ordinary messages need three flags, and geographical position is signified by four flags. Every registered ship has a signal number which is assigned it by the country whose flag it flies. Lists are published giving the name and signal number of all vessels.

The *semaphore*, which is used extensively in railway signalling, is adapted for marine signalling, and is most commonly used for coast-signal stations. The instrument consists usually of two arms, and is operated by electricity. The positions of the arms, to designate the alphabet, etc., are the same as those used by the hand flag in the hand semaphore code (see illustration for hand-flag code). Equipped with lights, *semaphores* are also used for night signalling. Night signals necessarily require light or sound systems. Flashes of light, corresponding to dots and dashes and using the Morse code, form the basis for most of the night signals.

The system used by most navies of the world consists of electric lanterns which will light either red or white. They are arranged vertically on a cable the length of one of the masts, and are operated by a keyboard.

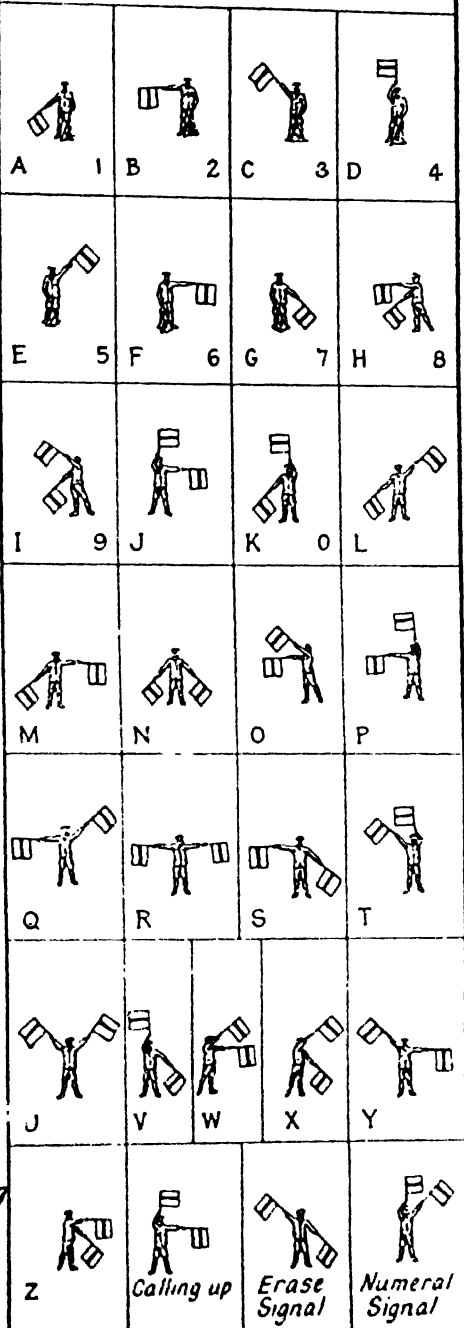
SIGNALLING

INTERNATIONAL CODE



Red
 White
 Blue
 Black
 Yellow
 Green

HAND-FLAG CODE



Messages may be sent quite rapidly by this method, though fog or mist require the use of sound signals.

Military Signalling. Means have to be provided for conveying information from the rear to the front, and vice versa, and there must be a system of communication between all arms and with the Air Service. A very important division of the British Army, called the Royal Corps of Signals, is organized to administer this function.

The types of signals used are wireless, radio-telephony, field telephone and telegraph, visual signals, and messengers. Wireless and radio-telephony are in increasing use in the fighting services, but the instruments are still large, heavy and delicate. The principal disadvantage, however, is the ease with which the enemy may intercept messages, and decipher a code. Since wavelengths interfere with each other, only a limited number of stations can be established. However, wireless in some form is the principal means of communication for occupants of military aircraft.

Line (telegraph and telephone) communication is the most efficient and perhaps the best method, but it requires considerable equipment and mechanical attention. Temporary lines may be laid on the ground, though usually in this case only the buzzer may be used, and the messages conveyed through the dots and dashes of the telegraphic code. The most serious drawback of line communication is its susceptibility to destruction by shellfire and mechanical track vehicles.

Visual signals include several devices used by ships—flags, lamps, semaphores, and heliographs (which see). This type of signal is used over short areas, for field communication between the rear and the front, and in places where more permanent connections are not practical. Flags may be used with positions to signify dots, dashes, and the pauses between words and sentences. Short and long flashes of light corresponding to dots and dashes are used at night. Semaphores and hand flags offer a rapid and effective means for transmitting messages at short distances.

Signalling by Aircraft. In war, news of concealed enemy guns, movements of his reserves or of troops assembling for counter-attack, must be sent to ground troops, and here aeroplanes are invaluable; aircraft are also used to report on the fall of shells from one's own guns.

Messages can be sent between air and ground by lamp, klaxon horn (from air only), wireless telegraphy, radio-telephony, firing of *Verrey lights*, dropping of smoke bombs and by message dropping and picking up. Orders can be sent to aeroplanes also from the ground by means of strips of cloth, and the

position of our own troops indicated to aircraft by coloured flares, or flashing bayonets, in answer to the klaxon horn.

SIGNET RING. See SEAL.

SIGNS OF THE ZODIAC. See ZODIAC.

SIGURD, *se' goord*. In Northern mythology, the brave warrior and hero of the *Volsunga Saga*. He was the son of Sig-mundr and Hiortis, but grew up at the court of his stepfather, Alf. Incited by the stories of Regin, his tutor, he set out to destroy the dragon Fafnir. After killing the monster, he ate its heart and found that he could understand the language of birds. They told him about Brunhilde, the beautiful maiden who slept in a palace surrounded by flames, awaiting the hero who would come to rescue her. Sigurd immediately mounted the hill to the palace, and awakened the imprisoned Brunhilde, whom he loved at first sight.

Finally, he reached the land of the Burgundians, where the queen, who was a sorceress, brewed for Sigurd a potion which caused him to forget Brunhilde and fall in love with her own daughter, Gudrun, whom he married. Later, he aided Gudrun's brother, Gunnar, to win Brunhilde as his wife. Brunhilde, unable to forgive his apparent faithlessness, had him put to death, and then in remorse killed herself on his funeral pyre.

The *Volsunga Saga*, which dates from the thirteenth century, is a primitive Norse version of the heroic epic poem *Nibelungenlied* (which see).

SIKHS, *seeks*. A word meaning "disciples," the name of a religious sect in North-western India, which worships one invisible God. It was founded by Guru Nanuk (1469-1539), who tried to unify the Hindu castes and unite them with the Mohammedans into one great brotherhood. The Sikhs form the larger part of the inhabitants of the Punjab. They are a strong, courageous people, and are chiefly engaged in agriculture and connected industries.

The political unification of the Sikhs was established by Guru Govind. He developed their military power, but after his death in 1708 his followers were overcome by the Moslems. A few of the Sikhs, however, escaped to the mountains, and in a few years returned and subdued Lahore. They established independent communities which were united in 1792 by Ranjit Singh, a despot who assumed the title of *maharajah* and governed a territory including all of the Punjab and Multan, and other adjoining regions, with a total area of 70,000 square miles. After his death, the Sikhs came into conflict with the British government in India. In the First Sikh War (1845-1846), they were defeated and forced to give up



GENERAL VIEW OF AMRITSAR, RELIGIOUS CAPITAL OF THE SIKHS

The holy tank or pool from which the city takes its name was built by Ram Das, fourth Guru of the Sikhs. The tank and the Golden Temple are in the foreground.

Photo: Indian Railways Bureau

Lahore. In 1848, during the Second Sikh War, they were completely conquered, and their possessions were added to British India.

In the Indian Mutiny of 1857 (which see), the Sikhs supported the British, and they have since been found to make excellent soldiers. There are now over 3,200,000 Sikhs in India.

SI-KIANG, OR WU NI KIANG. The most important river of South-western China. It has its source in the province of Yunnan and flows in a south-easterly direction for about 1050 miles, discharging through its delta into the South China Sea. Canton, one of the largest cities in China, is situated on an arm of the Si-kiang. The river is of considerable commercial importance, through its tributaries and a network of canals. It is navigable for the largest vessels as far as Wuchow, and from Wuchow to Samshui for lighter craft. Rapids interrupt navigation in the upper course.

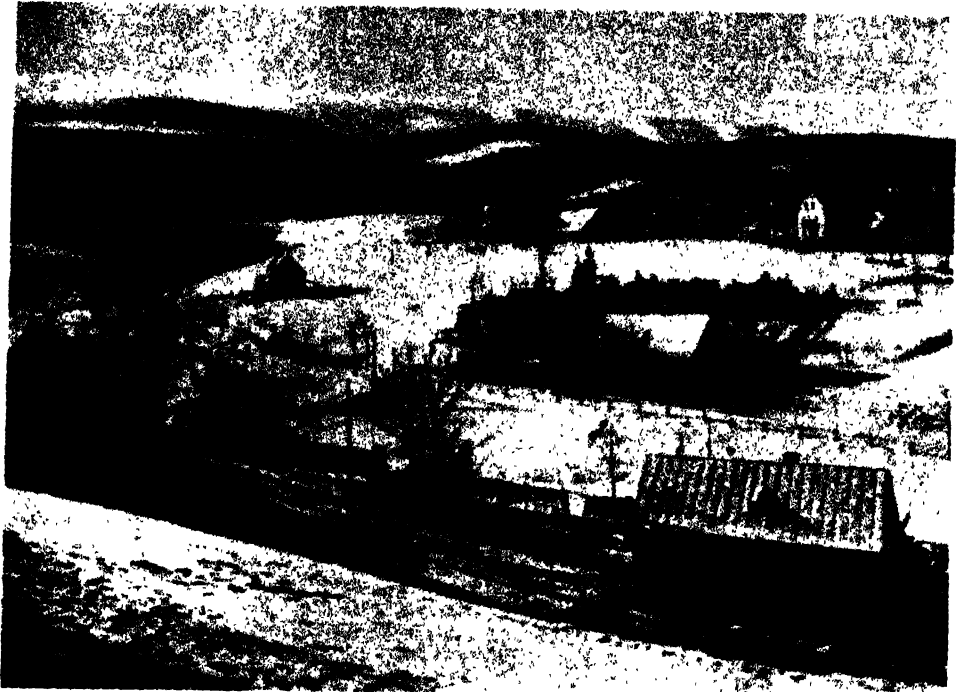
SIKKIM. An Indian state under British protection in the Himalayas between Nepal and Bhutan. It has an area of 2818 square miles and a population of 109,808 (1931) of Mongolian peoples, chiefly Bhutias and Lepchas. Most are Hindus, although the state religion is Buddhism. The whole country is mountainous, with peaks reaching 24,000 ft. Rainfall is heavy during the monsoon; the dry season is cold. All the lower slopes and valley floors are forested, and the population is scattered in clearings. They grow rice, maize, millet and temperate fruits. Gangtok is the capital. The chief

route between Bengal and Tibet passes through Sikkim.

Originally part of Tibet, Sikkim was under the nominal suzerainty of China even after 1816, when Sikkim accepted British protection, but in 1890 China fully recognized the British Protectorate.

SILENUS, si le' nus. In Greek mythology, a demigod, the most conspicuous of the satyrs. He was the nurse, teacher, and follower of Dionysus. He is represented as very fat, bald, and pig-nosed, riding on a broad-backed ass, and is usually shown intoxicated, swaying about, and brandishing his drinking cup.

SILESIA. An area in Central Europe, parts of which are in Germany (Prussia), Czechoslovakia, and Poland. Before the World War, Silesia was the name of a Prussian province and an Austrian crownland. The present Prussian Silesia is divided into the provinces of Upper and Lower Silesia, officially Schlesien. They originally had an area of 15,560 square miles, but now the area is 14,021 square miles and the population, 4,085,352 (1933). They comprise one of the important industrial areas of Germany. The Czechoslovak province of Moravia and Silesia, officially Slezsko, includes a small part of the former Prussian province. The Polish county of Silesia, officially Slask, has an area of 1629 square miles and a population of 1,298,851 (1931). The Oder drains most of this region. Coal-fields as well as iron, lead and zinc add to its commercial importance, and it was formerly



SILESIA LANDSCAPE IN WINTER

Photo: German State Railways

one of the chief industrial areas of Germany. Its present division was due principally to the plebiscite of 1920 provided for in the Treaty of Versailles. The zinc and iron works are chiefly in Poland. See CZECHOSLOVAKIA; POLAND.

SILICA, *sil'ika*. The most abundant and widely distributed mineral compound in the earth's crust, of which it is estimated to constitute 60 per cent. In the form of quartz, it is the chief constituent of most sand and an essential constituent of most varieties of crystalline rocks. In chemical combination with other substances, it forms part of many minerals, which are grouped under the general name of silicates.

Silica is an oxide of silicon, with the formula SiO_2 . It is found in nature in both crystalline and amorphous (without definite structure) forms. It is insoluble in water, and in all mineral acids except hydrofluoric acid. Crystalline silica forms the common mineral quartz and the rare minerals tridymite and cristobalite. Some varieties of precious stones, such as amethyst, jasper, and one kind of cat's-eye, are quartz delicately coloured. Other precious and semi-precious stones, such as opal, onyx, and chalcedony, are amorphous silica variously coloured. Flint and chert are amor-

phous silica which is coloured black or dull-brown by iron oxide and contains more or less alumina and other impurities.

SILICON. A very abundant non-metallic element, never found uncombined. When isolated it takes the form either of a reddish-brown powder or of hard, greyish crystals with a metallic sheen. Chemical symbol, Si.

SILK. There are five principal textile materials used in clothing the world—cotton, wool, linen, silk, and rayon. The method of obtaining silk from the cocoon was known at least 3000 years before the Christian era, the discovery being attributed to the Chinese. For over 2000 years they guarded the secret of the silk moth, and carried on a prosperous trade with other Asiatic peoples. From China, a knowledge of sericulture spread to Korea, and thence to Japan, in each case by the agency of war. In the sixth century A.D. the silk industry was established in the Roman Empire; it was introduced into Spain by the Moors in the ninth century and spread to Italy in the twelfth, eventually reaching Southern France in the fifteenth century. The first mention of silk in the history of England appears in certain statutes of 1363, regulating the silk industries in Edward III's reign. In the sixteenth century, Flemish



STAGES IN SILK CULTIVATION

1. Silk worms. 2. Japanese picking mulberry leaves. 3. Feeding mulberry leaves to silk worms. 4. Expert Japanese sorters grading cocoons. 5. The hatching of cocoons. 6. Syrian peasants making silk. The cocoons are boiled; this reveals the ends of the threads which the man is collecting together and connecting to the spinning wheel, with which the woman winds up the threads.

Photos: Keystone; U. & U.

weavers who came to England gave an impetus to the industry.

In Europe to-day, the production of raw silk is carried on most successfully in France and Italy; in Asia, Japan, China, India, Persia, Turkey, and Malaya produce large

Wild silk moths live out of doors and lay their eggs in trees. The cultivated silk moth lives indoors, is carefully tended and fed on mulberry leaves. In spring the eggs are hatched by artificial heat; the young caterpillars feed on the leaves of the white



SILK MANUFACTURE

Top: Winding machinery. Bottom: Machine making fine gauze silk hose.

Photos: Marleys



WINDING SILK

From hank to bobbin

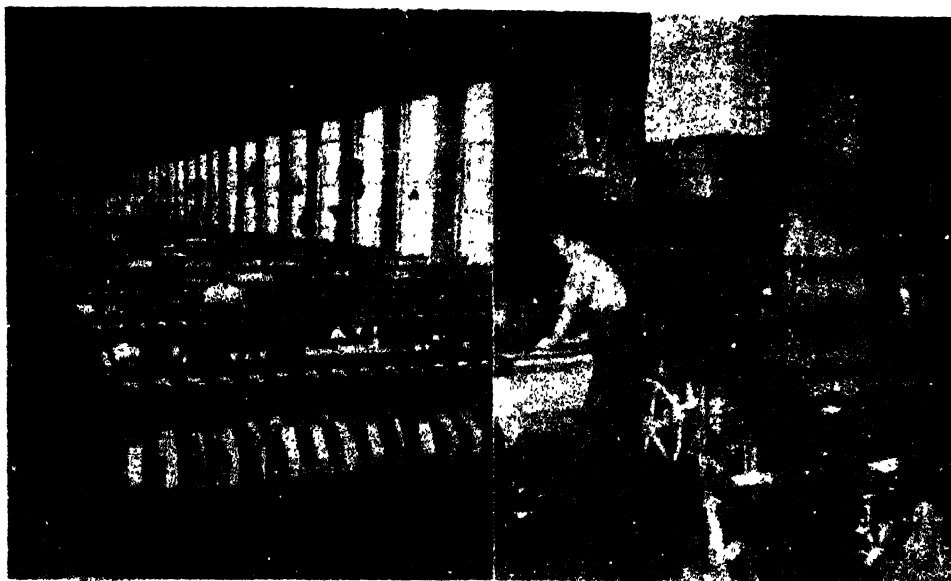
Photo: Marleys

quantities of silk cocoons. At the present time Japan leads the world's silk production.

The raw silk of commerce is obtained from the cocoon produced by certain species of caterpillar. These caterpillars have developed from eggs laid by the silk moth of which there are two main types, namely, the cultivated type and the wild variety.

mulberry, which are specially grown for silkworm culture. The caterpillar eats voraciously, grows rapidly, and sheds its skin four or five times in a period of about five weeks, and then prepares for the next stage of its life history. When fully grown, the caterpillar ceases to eat, and makes its cocoon. The outer covering, or floss, is first spun, and then the silk filament is wound about the body, the worm shrinking in size as it makes its cocoon. The liquid silk issues from two glands, one on either side of its body, connecting with an opening in the lower lip, called the spinneret. On contact with the air the gummy fluid hardens and becomes a filament consisting of two strands. Once the cocoon is completed the caterpillar changes into a chrysalis, which in course of time would develop, if permitted, into a moth. The chrysalis is, however, destroyed by exposing the cocoons to steam, or to dry heat, or to the sun's rays.

Thrown Silk. When the chrysalides have



SILK MANUFACTURE

Left: The winding room in which thread is wound on spools before passing to the weaving room.

Right: Weaving on a Jacquard loom.

Photos: U. & U.

been destroyed, the cocoons are sorted according to size, colour, etc., and the defective cocoons are sold for waste silk spinning. The perfect cocoons are reeled, that is, the filament is unwound. The cocoons are steeped in warm water in order to soften the gum that binds the filaments together. Five or more of these filaments are reeled at one time, forming what is known as a raw silk single. The separate filaments are first run through a porcelain guide similar to the eye of a fine needle, the filaments stick together because of the presence of the silk gum and emerge as a single strand, which is then wound upon a reel and thus becomes a hank or skein of silk. The hanks of silk are then sent to the "throwing" mill, where they are converted into different kinds of yarns suitable for weaving or knitting. "Throwing" consists of a number of operations, including sorting, washing, winding, cleaning, doubling, twisting, and classifying the yarn into various sizes and qualities. The double-thrown silk thread of several strands called *organzin*, is much used in silk weaving for making the warp.

Spun Silk. In reeling and throwing the silk a considerable amount of waste results; this waste, together with the outside floss covering the cocoons and damaged cocoons which are unreliable, forms the raw material from which silk is spun into yarn in very

much the same way that cotton is spun. On arrival at the spinning mill the waste is first degummed, either partially or completely. Freed from the gum, the silk waste



DRYING COCOONS IN SYRIA

After the steam killing process is over the cocoons are dried on the shelves for three months. They are turned each day.

Photo: U. & U.

is opened out and the fibres straightened by a combing process. Fibres of about the same length are combined into a thick rope which is made thinner and thinner until it is sufficiently thin to be twisted into a yarn. It is used in lower priced goods.

Tussah Silk. This is a type of silk obtained from the cocoon of the wild silk caterpillar found in China and India. From tussah silk low-grade yarns are spun and employed in the production of pongees, shantung, rajahs, and tussore.

Uses of Silk. From silk a very wide variety of materials is made, ranging from the flimsiest chiffons to the heaviest plushes. Silk is no longer a luxury fabric, because, owing to its reasonable price, it is bought by all classes, especially by women. Apart from its beauty and softness, silk has very good wearing qualities and gives the wearer a feeling of comfort and elegance. Light-weight silks are cool enough for summer wear, while heavier silks are sufficiently warm for winter wear.

SILK, ARTIFICIAL. The name of a comparatively new textile which during the past ten years has jumped into popular favour. (See RAYON.) Swan (afterwards Sir Joseph Swan) in 1877 was the actual inventor of artificial silk, and it was Swan, moreover, who christened his filaments "artificial silk." In the year 1884, Count Hilaire de Chardonnet patented a method of producing nitro-cellulose filaments, and as Chardonnet's artificial silk was launched specifically for the textile industry and that of Swan primarily for lighting purposes, Chardonnet is sometimes described as the father of artificial silk.

Vandura, made from a gelatine mixing, was one of the earliest artificial silks, and is referred to by Dr. Robert Hooke in his *Micrographia* of 1664. The nitro-cellulose process was first employed for the production of lamp filaments in 1883. In 1897 cuprammonium was improved and became a commercial proposition. In 1892 Cross and Bevan obtained a patent for the manufacture of viscose artificial silk. Acetate artificial silk was produced in 1901, though an earlier process had been patented in 1894. It was not, however, until 1905 that Miles produced a really satisfactory cellulose acetate.

SILLO AND SILAGE, si' layj. The word *silo* is applied to a tank-like structure in which green crops are allowed to ferment and are stored for winter feed for farm stock. The feed itself is known as *silage*.

SILURIAN, si' li' rian, PERIOD. The third period of the Palaeozoic Era, succeeding the Ordovician and succeeded by the Devonian Period. It takes its name from

the Silures, a tribe of ancient Britain. The Silurian system is extensively developed on all the continents. The life of the period consisted of a variety of marine invertebrates; fish, mainly marine, but including some fresh-water forms; and the earliest known air-breathing animals—scorpions and myriapoda. See GEOLOGY.

SILVER. A precious metal known and used from early times, possessing a beautiful lustre and a whitish colour. It was known to the ancient Hebrews by a term meaning "pale," and the name assigned to it by the Greeks signifies "shining." Its chemical



SILVER VEIN IN A MEXICAN MINE
Photo: Visual Education Service

symbol, Ag, is derived from the Latin word for the metal, *argentum*.

Properties. Although harder than gold, silver is softer than copper. It is one of the most malleable of all metals, for it can be beaten into sheets one hundred thousandth of an inch in thickness, or thin enough to transmit light. It is exceedingly ductile, capable of being drawn into wire finer than human hair. It is first among the metals as a conductor of heat, and is surpassed by no metal as a conductor of electricity.

Silver melts at about 1762° F., or 961° C. and when molten has the power of absorbing twenty times its volume of oxygen. Upon solidification, the oxygen is given up. Silver is not affected by moisture, dryness, alkalis, or vegetable acids, but sulphur or sulphuretted air blackens it, and thus it quickly tarnishes in rooms lighted by coal gas. Its non-corrosive properties make it valuable for surgical uses.

Uses. As silver is too soft to stand constant wear without any hardening element, for commercial purposes it is generally mixed with copper to form what is called an *alloy*. Such an alloy is used in making coins, jewellery, and tableware. Silver plate is a

coating of silver on some other metal. "Solid silver" articles are made entirely of silver alloy. Silver wire, bands, and plates are used to some extent in surgical practice.

One of the most important compounds is a white solid called *silver nitrate* and *lunar caustic*. It is produced by dissolving silver in nitric acid, and is employed extensively in photography, silver plating, and in making indehible ink. *Silver chloride*, another compound, is made by adding hydrochloric acid to a solution of a silver compound. This salt, together with silver bromide, is used extensively in photography.

Silver fulminate is a violent explosive, but has been displaced as a constituent of explosive material by mercury fulminate and other compounds less costly.

Sources. Mexico, the United States, Peru, Canada, British India, and New South Wales are the chief regions from which native silver is obtained. The most important ores are the sulphides.

SILVER NITRATE. See LUNAR CAUSTIC.

SIMILE, *sim'ile*. A figure of speech in which some resemblance between two objects essentially different is pointed out by means of some definite connective word, usually *like* or *as*. The so-called *Homeric simile* is a long, involved comparison, worked out beyond the point where real resemblance ceases. See FIGURE OF SPEECH; METAPHOR.

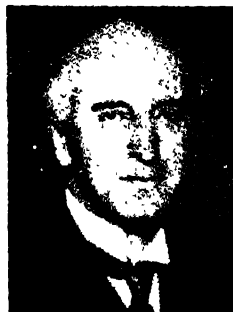
SIMLA. See INDIA.

SIMNEL, LAMBERT (about 1477-1534). This son of an Oxford tradesman was a personable child of some education and breeding. When he was about ten, he was put forward by Richard Simon, a priest, to represent the younger brother of Edward V. Lord Lovel and other banished Yorkists appear to have changed the impersonation, and he was next said to be Edward, Earl of Warwick, the son of George of Clarence. He was accepted as nephew by Margaret, Dowager Duchess of Burgundy and sister to Edward IV and Clarence. Ireland was always a Yorkist stronghold—from respect, it is said, for the memory of Richard II.—and he was acknowledged by the Earl of Kildare and crowned at Dublin in 1487. An army invaded an unenthusiastic England and was defeated at Stoke-on-Trent.

This defeat was fortunate for Simnel, for, if his forces had triumphed, would certainly have quietly disappeared when the real Warwick was brought from the Tower to the throne. Henry VII made him a kitchen boy; he later rose in the royal service, becoming falconer and cupbearer.

SIMON, SIR JOHN (born 1873). English Liberal statesman. He was educated at Fettes College, Edinburgh and Wadham College, Oxford, where he was President of

the Union in 1896. Called to the bar in 1899, he entered Parliament in 1906 as member for Walthamstow. His rise to eminence at the bar was extraordinarily rapid, and within a few years he held one of the most remunerative practices. Knighted in 1908, he became two years later Solicitor-General and then Attorney-General. During the War he was Home Secretary in Asquith's administration, but resigned on the Conscription issue and went to France as Major in the Royal Air Force. After the War, on account of a feud with his leader, Lloyd George, which re-



SIR JOHN SIMON
Photo. Fox

sulted in the Liberal Party being split, Sir John Simon returned to his bar practice for a time, but then accepted the Chairmanship of a Royal Commission on India. The issue of its report, known as the Simon Report, in 1930, was an important step on the way towards the federation of India, which was finally accomplished in the India Act of 1935.

During the nine days' General Strike of 1926 he had played a prominent part by exposing its real character as a threat to ordered government and he was the chief author of the Trades Disputes Act of 1927 whereby strikes whose object was to coerce the Government or the public were declared illegal.

On the formation of the National Government in 1931, Sir John Simon organized the Liberal supporters of the coalition as a National Liberal party and accepted office (for the first time since 1916) as Foreign Minister. On the reconstruction of the ministry in 1935, he went over to the Home Office.

SIMONIDES, *si mon' id ee* (556-467 B.C.). A celebrated Greek lyric poet and one of the most accomplished men of antiquity, born on Ceos island. He excelled in his triumphal odes and elegies.

The young poet was treated with great consideration by Hipparchus, and later, he enjoyed the patronage of powerful families of Thessaly. After the invasion of Greece by the Persians, he wrote a number of elegies, dirges, and epigrams celebrating the heroes and the battles of that struggle; for his elegy on the soldiers who fell at Marathon, he won the prize over Aeschylus. His last years were spent at the court of Hiero of Syracuse.

SIMON THE CANAANITE. See APOSTLES.

SIMONY. This word is derived from the name of Simon Magus, who desired to buy the gift of the Holy Ghost with money (Acts viii. 18). Thus it means any sort of trafficking in sacred things, and more particularly the buying and selling of Church preferments or benefices.

By the *Benefices Act* of 1898 a declaration has to be made by every clergyman in the Church of England, on accepting a benefice, in which he affirms that he does not know of, and has had no participation in, any simoniacal transaction leading to his preferment.

Simony includes the demanding of money for the administration of the Sacraments, and, in the Roman Catholic Church, the sale of any blessing.

SIMOOM. A hot, dry, destructive wind common to the Sahara and Arabian deserts, which carries with it great clouds of dust, making the sky hazy. This wind is caused by the overheating of the soil and layers of air next to it. The burning hot air ascends, and cooler currents from all sides flow in, producing a desert whirlwind.

SIMPSON, SIR JAMES YOUNG (1811-1870). A distinguished Scottish physician, the discoverer of the anaesthetic qualities of chloroform. See ANAESTHETIC.

SIMS, WILLIAM SOWDEN (1858-1936). An American Vice-Admiral who commanded the United States naval forces in European waters after his country joined the Allies in the World War.

SIN. Sin in its deepest significance is enmity to the Will of God, resulting in transgressions of that Will. It involves two factors—God who acquaints man with His Will, either by revelation or through right reason—and man, possessed of a will free to choose to obey or to disobey. The word is meaningless if God does not exist, or if His laws are unknown; it has equally no meaning if man is not morally a free being.

The Christian doctrine of sin is contained in the New Testament. The teaching of Jesus on the subject is characteristically concerned simply with the relation between God and men. Two ideas lie at the roots of it—that of the fatherhood of God, and that of the Kingdom of God. Men are sons of God and subjects of God, and sin is the rejection by the son of the loving will for him of the Father, and by the subject of the authority of his sovereign.

The doctrine of Saint Paul, though more elaborate, is consonant with this. Sin also with him is disloyalty. It "dwells in" the sinner, and produces a slavery, not through outward compulsion, but through inward consent to an authority other than God's.

In Christian theology sin is divided into original and actual sin. Original sin is the taint in humanity derived from the Fall. The guilt of it is washed away by baptism but the tendency remains, and becomes actual sin when it takes effect in the deliberate choice of what is known to be wrong.

Actual sin is itself divided into mortal—"deadly"—sin, which separates the sinner from the grace of God, and venial sin of a less weighty kind. The guilt of all sin, mortal or venial, can be removed by repentance.

SINAI, si' ni'. The desert mountain called also in Scripture *Horeb*, on which Moses received the Law. It is supposed to be one of the three peaks of the mountain range on Sinai Peninsula, which lies between the two arms of the Red Sea—the gulfs of Suez and Akaba. However, the Mount Sinai mentioned several times in the Bible has not been conclusively identified. The Children of Israel camped on the plain before Sinai while Moses remained forty days upon the mountain, at the end of this period, he returned with the Ten Commandments, written on tablets of stone (Exodus xix-xx).

SIND. Formerly part of the Bombay Presidency, this became a separate province of British India in 1935. Its area is about 46,500 square miles. A low alluvial plain is crossed by the Indus, which in the north emerges from a rocky gorge and in the south breaks into a number of branching tributaries and forms a great delta. A broad, dry valley to the east marks the former course of the river. The rainfall is seldom over 5 in. a year, and the temperatures are high. Consequently agriculture is dependent on irrigation, which was formerly by inundation canals, but since 1933 has been vastly increased by the Sukkur or Lloyd barrage near the mouth of the gorge. This will eventually irrigate 7,500,000 acres. Rice, wheat, millet, and cotton are grown. The population, rapidly increasing since the barrage was completed, is now 4,000,000; most are Mohammedans. The chief towns are the port of Karachi (population 263,565), which is primarily the wheat port of the Punjab and an Indian airport, Hyderabad, at the head of the delta where the Indus is bridged, and Sukkur. Railways link Karachi and Hyderabad with the Punjab and the rest of India.

Sind was an independent state until conquered by the Mohammedans in A.D. 712, and was ruled by Indian princes until absorbed by Persia in 1739. In 1838 a British force marched through it on the way to Afghanistan, and in 1843 it was annexed by Great Britain.

SINEW. See TENDON.

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ISBN: 978-81-8205-496-7 (Set)
ISBN: 978-81-8205-497-4 (Vol. 1)
ISBN: 978-81-8205-498-1 (Vol. 2)
ISBN: 978-81-8205-499-8 (Vol. 3)
ISBN: 978-81-8205-500-1 (Vol. 4)
ISBN: 978-81-8205-501-8 (Vol. 5)
ISBN: 978-81-8205-502-5 (Vol. 6)
ISBN: 978-81-8205-503-2 (Vol. 7)
ISBN: 978-81-8205-504-9 (Vol. 8)
ISBN: 978-81-8205-505-6 (Vol. 9)
ISBN: 978-81-8205-506-3 (Vol. 10)